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ABSTRACT

Two surveys were conducted to identify the essential characteristics of minority engineering programs and to provide summaries of ongoing minority programs in a broad sampling of engineering schools. The first surveyed colleges with the largest minority enrollments, including the 6 traditionally Black schools and 45 predominantly white schools. The second was an initial survey of 225 engineering institutions, of which 164 responded. Of the 164, only 59 supplied sufficient descriptive data. Elements of effective minority engineering programs were classified into goals of college minority programs, relationships of college locales to student sources, staffing of minority programs, consortia and community involvement, pre-college high school programs, identification and recruitment, admissions procedures and criteria, pre-matriculation summer programs, support programs, retention, financial aid programs, and predominantly Black schools of engineering. This report contains an analysis of the various approaches that have been used and proven successful, and brief descriptions of 59 individual college minority engineering programs. Tabular data are given on the total full-time engineering enrollments in 1974; engineering schools by number of full-time minorities enrolled and reported programmatic activities in 1973; the engineering schools and the number of Black, Spanish-surnamed, and Indian students enrolled in 1973; geographical location of the engineering population in 1972; and the distribution of minority origin persons by regions and state in 1970. (NQ)

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BUILDING EFFECTIVE MINORITY PROGRAMS IN ENGINEERING EDUCATION

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A report of the
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PREFACE

This is one of the first of a series of publications issued by the Committee on Minorities in Engineering as part of a national campaign to substantially increase the representation of American Indians, Black Americans, Mexican-Americans (Chicanos), and Puerto Ricans in the engineering profession.

The Committee is a unit of the Assembly of Engineering of the National Research Council (NRC). The NRC is the principal operating agency of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

Providing advice and support to the Committee is the National Advisory Council on Minorities in Engineering, comprising the chief executives of some of the nation's leading corporate and academic institutions, engineering societies, and minority organizations. The Council also includes U.S. government officials at cabinet and sub-cabinet levels.

The primary objective of the Committee is to provide effective national leadership and to coordinate the various activities best calculated to advance the participation of additional members of minority groups historically under-represented in engineering. Membership on the Committee, like that of the Council, is broadly representative of engineering schools and societies, racial and ethnic organizations, industry, and government.

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INTRODUCTION

As part of the recent concern with bringing able members of racial and ethnic minorities into the mainstream of the nation's social, cultural, and economic life, a vigorous program is now underway to attract more of these men and women into engineering. Why engineering? Perhaps more than any other profession in the United States today, engineering opens the way to management careers in business, industry, and government -- positions that provide "a piece of the action." In an open, just, and upward-mobile society, therefore, a compelling case may be made for substantially increasing the number of engineers from the most underrepresented minorities -- Blacks, Mexican Americans (Chicanos), Puerto Ricans, and American Indians.

In 1974 less than 3 percent of the engineers in the United States came from these four minority groups, although, taken together, they made up nearly 17 percent of the entire population. The constructive response to this obvious disparity is to stimulate more minority students to earn engineering degrees.

Until now the principal deterrent to participation has been that the number of minority engineering graduates was woefully inadequate. In the Class of '74, for instance, only 1.8 percent of the engineering degrees went to Blacks, who, as a group, comprise 11.1 percent of the population. Students with Spanish surnames made up 1.5 percent of the engineering graduates, although this group represented 4.4 percent of the total population. It was worse for American Indians, who are 0.4 percent of the nation's inhabitants, but received only 0.07 percent of the engineering degrees last year.

After the educational field, engineering is the second largest professional occupation in the country. For men it is the predominant profession. The employment of engineers has expanded by more than 80 percent since 1950, mainly because technology has burgeoned in the past 25 years and many engineers have advanced into management positions. Even so, few minority youths have been either motivated or trained to become engineers.

The reasons for this are deep-set in the experience of minorities. Historic patterns of discrimination have frustrated or discouraged minority students from seeking engineering degrees because the field was considered to be largely a domain for Whites. Related to this is the cyclic nature of engineering. In good times, jobs are plentiful, but in lean times when jobs are scarce, members of minority groups fear they may fall victim of the "last hired, first fired" syndrome or, if seeking employment, find themselves unwanted.

What's more, as the most economically and educationally disadvantaged, these four minorities often lack the rigorous academic preparation for engi-

neering school and the family or peer models to emulate in choosing a career. Thus when minority youths are motivated to enroll in engineering studies, attrition can be high unless adequate supportive programs are available.

Much has been accomplished since 1968, when the first significant minority programs began in engineering colleges and, particularly, since 1973, when the Minority Engineering Education Effort (ME³), sponsored by the Engineers Council for Professional Development, set as its ultimate goal a 10 to 15 percent rise in minority enrollment in engineering at the end of ten years.

For most of the engineering schools surveyed in this report, the discovery and development of minority students is now a top priority. Efforts are being directed at retaining minority students in engineering schools and programs are being specifically structured to meet their needs.

It is abundantly clear from the survey that neither the students nor the system can be changed rapidly. During its study of the situation, the Committee on Minorities in Engineering used the data supplied by colleges and universities throughout the country to determine the programs and the component parts that appeared critical to increasing minority participation in engineering. The objectives of the study were threefold: (1) to identify the essential characteristics of minority engineering programs that should increase the likelihood of meeting the needs of both students and schools; (2) to provide summaries of ongoing minority programs in a broad sampling of engineering schools, and (3) to publish this information for program personnel, industrial and philanthropic organizations, and others involved in new or expanding engineering programs for minorities.

Methodology

This study involved two research tasks: (1) A survey of minority engineering programs was conducted by Donald G. Dickason, Assistant Dean of Engineering at Cornell University; the information obtained is evaluated in Part I of this report, and (2) a collection of program descriptions gathered from many engineering schools is presented in Part II.

Dickason's survey focused on the colleges with the largest minority enrollments, including the six traditionally Black schools and 45 predominantly White schools. In 1974, these schools accounted for more than 50 percent of the total undergraduate enrollment of minorities in engineering. Part I contains an analysis of the various approaches that have been used and proven successful, although no attempt was made to evaluate the programs. It represents a consensus of what program managers consider to be sound and useful approaches to minority programs now in formative or expansive stages.

The compilation of Part II contains the minority program reports derived from an initial survey of 225 engineering institutions. Of the 164 schools that responded to the survey, only 59 supplied discernably sufficient amounts of descriptive information needed for this listing. Program information assembled by committee staff came from correspondence, catalogues, reports, proposals, and telephone calls.

CONCLUSIONS AND RECOMMENDATIONS

A number of colleges of engineering have gained considerable experience in initiating and operating special programs for minority students. This experience has evolved primarily through trial-and-error. Although the programs included in the study were initiated to meet the real needs of minority students, they are remarkably diversified in scope. No single formula or model emerged as exemplar in developing a minorities program in engineering. Each program has adjusted, as it turns out, to a complexity of interrelating factors, such as the availability of minority students, their academic backgrounds, the limits of funding, the level of industrial cooperation, and the degree of support from university administration and engineering faculty.

Despite the diversity of approaches, all of the college programs undoubtedly have been struggling with some of the same problems. The major ones have been identified: (1) how to identify and motivate a significant number of minority youth to pursue careers in engineering; (2) how to effectively recruit minority youth; (3) how to assist those with weak scholastic backgrounds, and (4) how to support enrolled students financially, academically, and socially in order that they may obtain an engineering degree.

Many factors were found to be essential in establishing and maintaining effective minority engineering programs. The program managers agreed that the following seven elements must be present to build a structure that will result in graduating fully qualified, competent engineers from racial and ethnic minorities. The fundamental elements are:

- Commitment to the program by the college of engineering faculty as well as university administrators;
- Recruitment and maintenance of an enthusiastic, qualified, and dedicated program staff, assigned specifically to the program;
- Development of a comprehensive plan for the program;
- Assessment in a realistic manner of the target minority population in the community or region;
- Development of appropriate and adequate identification and recruitment of qualified and qualifiable minority students;
- Organization of academic, social, and financial support for students in engineering school, and
- Identification and provision of additional financial aid.

It is recommended that program administrators and potential administrators

should share their experiences, problems and frustrations through consortia, seminars, and conferences. Substantive workshops need to be provided in meetings of the appropriate professional and technical societies and organizations such as the American Society for Engineering Education, American Society of Mechanical Engineers, American Society of Civil Engineers, Institute of Electrical and Electronics Engineers, and the Engineers' Council for Professional Development. Serious attention must be given to collecting and analyzing data on the retention of minority students; to studying ways of enhancing the knowledge and understanding of various environmental backgrounds and educational experiences; and, to obtaining a better understanding of the value of tutoring and developing study skills.

The goals enunciated through the Minority Engineering Education Effort (ME³) and the Committee on Minorities in Engineering should involve all engineering schools, a broad cross-section of industry, foundations, and minority groups, as well as state and federal governments which all bear a portion of the responsibility for providing minority men and women the opportunity to participate in and contribute to a profession which can so significantly affect their lives and their society.

PART I: ELEMENTS OF EFFECTIVE MINORITY ENGINEERING PROGRAMS

Chapter 1

GOALS OF COLLEGE MINORITY PROGRAMS

The first significant minority program in engineering began in 1968, three years after the advent of general "affirmative action" admissions programs in universities. However, there are almost no cases among the schools examined in which the university affirmative action program had generated an engineering minority program. In virtually every case, the engineering college started its own minority program. Sometimes there was support from the university administration; sometimes this assistance was not available or necessary.

Of interest, too, is the fact that policy statements by the colleges of engineering that operate these minority programs are rare. Rarer still are policy statements that have formal faculty approval by the institution. De facto practices and policies have been instituted in a number of institutions, such as Cornell and Illinois Institute of Technology. However, the presence or absence of formal policy, the level at which it was approved, or the lack of approval shows no relationship with program effectiveness.

Articulation of Goals

While formal policy manifestos by colleges of engineering with respect to minority programs are rare, the goals are articulated through various means: pamphlets, funding proposals to industry and foundations, and statements prepared for conferences. In a few instances, however, there are formal policy documents. These are of two types: (1) result based and (2) process or activity based. While some schools employ only one, a few use both.

Result based goals include one or more of the following:

- To identify, recruit, and/or enroll an increased number of minority students.
- To increase the retention rate of minority students.
- To ensure that additional minorities complete and graduate from an engineering program.
- To identify, recruit, enroll, retain, and graduate students who are qualified, qualifiable, or qualified but disadvantaged.
- To strive for a numerical goal of minority students based on the proportion of students in the state or area.

Processed based goals include one or more of the following:

- To facilitate the flow of engineering information to minorities.
- To improve the image of the profession of engineering.
- To formulate special admissions criteria that accurately reflect learning potential.
- To foster adequate financial aid for minorities in engineering.
- To develop support programs in tutoring, counseling, and advising.

One of the most comprehensive programs examined in this survey was the Student Council for Recruiting, Motivating and Educating Black Engineers (SCoRMEBE) at the University of Kansas, which includes raising funds, recruiting students and staff, establishing liaison with faculty and staff, and the planning, implementation, and evaluation of program activities.

Chapter 2

RELATIONSHIPS OF COLLEGE LOCALES TO STUDENT SOURCES

The framework for most minority engineering programs is usually defined by the demographic characteristics of the area served by the institution and particularly whether there are large numbers of college-age minorities. However, large minority populations in the community alone do not necessarily indicate engineering student potential. There has to be a high proportion of students who finish high school; the high schools need to offer college requisite mathematics and science courses.

The public or private affiliation of schools has little to do with the overall development of minority programs. Excellent programs can be found in both types of institutions, although some variations do occur, depending upon the sources of students and recruiting techniques. Public institutions usually concentrate their recruiting within the host state and most are obliged to follow a state formula on admissions. Private colleges have greater latitude, by contrast.

In establishing a framework, program developers need to confront the following questions and consider the implications of their responses:

- How does the physical location affect recruitment policies?
- Will recruitment and enrollment require extensive travel for the recruiter and student?
- Are there special or extraordinary state, federal, or local guidelines for admissions?
- Is there a statewide testing program?
- Will the student need to commute? What is the implication of this for supportive services?
- How will external constraints affect the institution's admission of minorities?

Attention to demographic factors is desirable in planning a comprehensive minorities program, but program developers should avoid trying to establish and meet certain criteria relating to the racial and ethnic components of the surrounding population before launching a program. Rather, experience with

existing programs shows that it is prudent to obtain a general picture of those components as an aid to designing the program and determining where the students are to be found. As the program matures, however, a more careful analysis of student sources and areas of organizational support will be beneficial in expanding and evaluating the program.

Chapter 3

STAFFING OF MINORITY PROGRAMS

The origin of engineering minority programs usually can be traced to one or two individuals on a college faculty or staff who recognized the need and were willing to devote their time and energies to the project. Once launched, the sound development and expansion of a program usually is attributable to a staff person specifically assigned to the task. In programs without staff, the role of organizer and manager may become the responsibility of a faculty member.

The review of minority programs elicited a number of pertinent details relating to staff.

Professional Staff Ratios

Some 55 percent of the programs have professional staffs assigned. The time devoted to a program ranges from one person spending one-quarter time to three persons working full time. Most of the programs have some secretarial assistance, but only a few have full-time help. Students are employed in some support and clerical functions. The 1974 Sloan Foundation report, Minorities in Engineering: A Blueprint for Action, recommends a ratio of student to staff of 200 to 1. About 75 percent of the programs with assigned staff had ratios of 200 to 1. With increased recruitment at the freshman level and with subsequent larger enrollments, this ratio may have to widen, however.

Funding Sources

The programs are underwritten by college funds, university funds, industrial grants, state sources, or a combination of these. College work-study funds are used extensively for the salaries of clerical workers in the programs. There are no significant differences in the ability of public and private institutions to obtain funds. Most of the colleges and universities, public or private, rely heavily upon the engineering colleges.

The availability of state funds for program purposes, as opposed to the availability of student financial aid, varies widely. For example, the state of California does not fund minority engineering programs, while New Jersey and Pennsylvania in particular have provided meaningful resources. New York state has funds available for low income and low academic students, but this money has been of limited use for minority engineering programs.

While portions of grants from industries and foundations are applied to staffing by many schools, nearly all these sources professed a desire to keep such overhead low.

Reporting Chains of Command

The minority program staff director generally reports directly to the dean of engineering. Titles for the former vary, but the most common are "Assistant to (for) the Dean" and "Director, Minority Engineering Program." A few program heads report to the academic affairs office, the university minority program, or to the university admissions officer and/or dean of students.

Most colleges prefer to have a minority engineer conduct their program, but few have been successful in recruiting such an individual because of the other professional goals of Minority Engineering Graduates. However, colleges attempt to involve minorities in some capacity on the staff because, generally, these persons possess the insight and sensitivity to hasten and enhance the adjustment of the minority student to a predominantly White environment. All but six of the schools included at least one minority person in their program. This review revealed that there are many non-minority administrators who are effective in working with minority students.

Although it is desirable for an administrator to have a technical background, this attribute is secondary to the person's sensitivity, concern, and ability to think positively about engineering and to learn quickly about the profession.

Program Leadership

Minority programs go through a maturation process requiring different types of leadership at different phases. At the beginning of a program, what could be termed Phase I normally is conducted by a committed enthusiast who gets the job done. It is a one-person operation. The immediate goal is to energize all elements of the engineering college to accept and support a minority program and to recruit students. The realm of the program is rather limited at the start, but as it matures it begins to widen and affect more organizations and institutions.

When the program moves into Phase II, it seems to require a different type of leader -- one who can handle a more systematic relationship with the college and university bureaucracy and can administer, catalyze, coordinate, and gain the support of a much larger number of elements. Sometimes the Phase I leader matures with the program; in other instances, new leadership may become necessary.

Recruiting and post-matriculation program support also change as the program develops. Both need to be planned together, of course, but in the early stages of a program the actual volume of support service activity will tend to be lower. As enrollment increases, more of the staff member's time will be required by the enrolled students, especially if the staff person also is conducting on-campus counseling and communication and does not have access to an institutional support program.

Chapter 4

CONSORTIA AND COMMUNITY INVOLVEMENT

A number of consortia have been formed in various sections of the nation with the objective of coordinating and expanding collective efforts in the areas of early identification of students with interest and potential in engineering, early motivation, guidance, and recruitment at the pre-college level, and retention after matriculation. Most consortia are located in urban areas and are targeted at one or more minority groups. These consortia are usually assembled by engineering colleges, industry, professional groups, and minority organizations. This trend, while still in its early stage, has been stimulated largely by the efforts of the Committee on Minorities in Engineering.

The composition of some consortia illustrate how broad segments of society may be mobilized. For example, the California Consortium for Minorities in Engineering focuses on a minority population of more than 2 million in the Greater Los Angeles area. Among its academic members it lists the California State University branches at Long Beach, Los Angeles, and Northridge; California State Polytechnic University in Pomona; the University of California at Los Angeles; and the University of Southern California. The professional and community groups include the Los Angeles Council of Black Professional Engineers, Society of Hispanic Professional Engineers, Los Angeles City Employees Chicano Association, the Human Resources Development Committee-Los Angeles Section, American Society of Civil Engineers, and Rockwell International's Community Interface Program.

Another joint venture exists at Oklahoma State University. It consists of a consortium comprising the engineering school, the local industry, the minority community, and the state government in a Council of Partners to Increase Black Graduates in Engineering, Technology and Architecture. The industrial participation is viewed as a key to the viability of this program.

Other consortia are being formed in the Midwest and in the Southeast which include the major engineering schools located in each geographical area.

The Committee on Institutional Corporation (CIC) Consortia, consists of 13 midwestern schools. Participants in this project include the Universities of Illinois, Iowa, Michigan, Minnesota, Wisconsin and Purdue, Northwestern, Michigan State and Ohio State Universities -- and the Illinois Institute of

Technology and Notre Dame University. Its primary objective is to substantially increase the pool of minority secondary school students in the midwest motivated toward and capable of entering engineering colleges.

Chapter 5

PRE-COLLEGE HIGH SCHOOL PROGRAMS

Many engineering colleges are working directly with students in high schools to (1) inform them of the advantages of engineering careers and (2) build the math and science skills of interested students.

According to program administrators, these activities have been quite successful. The Minority Introduction to Engineering (MITE) program sponsored by the Engineers' Council for Professional Development has the largest number of summer programs identified in the study. These are designed primarily by the school administrators working with programs and exposes the summer student to educational and career opportunities in engineering. In addition, Purdue, Stevens Institute, Tulane, Wayne State, and several others run active summer programs for interested high school students.

A small number of schools are operating Saturday programs primarily for high school junior and/or senior students. Illinois Institute of Technology, for example, conducts a special academic session on Saturdays for high school juniors and seniors, as well as a nine-week summer session for juniors. Pratt Institute operates a Saturday activity that includes graduates from the General Education Development program (GED) among the regular sophomores, juniors, and seniors invited to the campus for pre-engineering and pre-science education.

This survey of colleges reveals that while special summer or Saturday programs have merit, a difficulty exists in establishing preparatory programs as a regular part of the high school curriculum. Some colleges are working closely with public school administrators and faculty to offer special courses which will improve math and science skills. In a few cities efforts are being initiated to create pre-engineering/technology high schools.

All of these programs have the potential of expanding the pool of qualified minority students, but there are too few endeavors of this type to make a significant impact. Many students qualified in sciences do not pursue engineering, but take other options, such as medicine and business. Consequently, if minority engineering programs are to grow, the pool of able candidates must be enlarged.

A number of community colleges are exploring several techniques to accomplish this end. They seek advocates among high school teachers and school

boards and assist engineering college representatives in gaining membership on school boards. However, to have real impact on secondary education, engineering colleges need to have a comprehensive plan of action that can be sustained over a number of years.

Chapter 6

IDENTIFICATION AND RECRUITMENT

Engineering historically has been a low-visibility profession in minority communities. While awareness of engineering career opportunities is increasing, minority programs must continue to expand their activities in order to effectively identify and recruit potential students.

Only a few of the programs surveyed contain comprehensive or diverse strategies needed to successfully identify and recruit students. This is due usually to professional staff limitations. Program managers stress the need for a number of coordinated methods to assure optimum results. The following highlights various methods that are in use:

High School Visitations

Visits to high schools by minority program staff are the most widely employed technique. Often this is the only approach to inform students about engineering careers. Program managers report that the success rate per visit, as measured in the number of college freshmen, often is low and the cost in manpower relatively high. Nonetheless, the activity is considered important in enhancing the awareness of students and teachers and in producing a greater cumulative effect.

Mailings

Mailing letters and brochures on engineering studies and careers complements both the strengths and weaknesses of high school visits. Mailings provide a relatively inexpensive way of reaching a scattered population of potential engineering candidates. The major constraint, however, is that qualified students may not have taken the appropriate tests or other action necessary to be included on mailing lists. There are five major sources of lists: (1) American College Testing Program (ACT); (2) Aspira, a Puerto Rican educational organization; (3) College Entrance Examination Board (CEEB); (4) Minority Engineering Education Effort (ME³), and (5) the National Scholarship Service Fund for Negro Students (NSSFNS). Ethnic and community organizations also compile lists. Program managers stress that mailings should be followed with telephone calls or home visits by competent staff or practicing engineers.

Parental Involvement

Contacts with parents may sometimes help influence the student's choice of career and school. During the recruiting process, parents should also be informed of the available opportunities for financial aid.

University Recruitment

The engineering aspects of minority programs need to be forcefully presented within the larger minority recruitment effort of the university or institute in order to make certain that the engineering program is championed.

Minority Engineering Students

It has proven successful to involve matriculating minority engineering students in recruitment drives. These students often serve as enthusiastic role models in the recruitment effort.

Engineering School Alumni

At present, minority alumni are few in number, but when and where they exist they can serve as excellent recruiters. Practicing engineers are better able to relate the opportunities for minorities to the requirements and the rewards, both academically and materially.

High School Science and Mathematics Teachers

This group of professionals may be very influential in recruitment efforts. Many can be located and identified through the National Science Teachers Association in Washington, D.C., and mailing lists can be obtained, based on such criteria as fields, distinctions, grade level, and location.

Area Community Colleges

A significant number of minority engineering candidates are now transferring from community and junior colleges to engineering schools. Some schools in the survey find these their best sources for producing qualified students.

Open Houses

Some of the colleges stage open houses to acquaint local students with engineering programs. They periodically invite busloads of students to their campuses from remote areas.

Mobile Van

One school included in the survey, the University of Michigan, uses an attractive van to tour high schools and community colleges. The minority program managers talk to students and distribute literature about engineering.

Additional Strategies

A number of other techniques were cited. One school offers paid visits to its campus to outstanding applicants. Another cooperates with a local high school in giving students college-level courses, and waives tuition in some cases.

At the time of this survey, none of the colleges were attempting to recruit from a university's non-engineering minority freshmen, a practice which may offer significant potential for reaching out to able minority men and women.

TABLE I

IDENTIFICATION AND RECRUITMENT PRACTICES CONTAINED AT VARIOUS COLLEGES
(See Table I in Appendix for schools listed according to reference numbers)

Technique	Frequency Cited	References
High School Visitation	11	6, 7, 8, 15, 19, 21, 23, 26, 32, 35, 36
Mailings	6	15, 16, 25, 34, 40, 45
Parental Involvement	4	10, 23, 35, 38
University Recruitment	0	0
Minority Engineering Students	3	1, 15, 21
Engineering School Alumni	2	1, 34
High School Science and Mathematics Teachers	2	14, 27
Area Community Colleges	2	7, 15
Open Houses	2	1, 6
Mobile Van	1	26

Chapter 7

ADMISSIONS PROCEDURES AND CRITERIA

A distinguishing feature of effective minority engineering programs is that staff personnel are involved in the admissions process as well as in identification and recruitment. They also are responsible for assisting the students after matriculation. The combination of pre- and post-matriculation activities in a single office is regarded as essential to any minority program's continuity. The program manager needs to be aware of the academic strengths and weaknesses of every student that is recruited. After matriculation, the student identifies the program manager as the individual responsive to the need for tutoring, counseling, and finance. The program manager, then, is identified by most minority students as central to admissions, to scholastic success, and to graduation.

Admissions occupies a key place in any minorities educational program. There are different approaches to admissions from the institutional aspects. Many colleges and universities, most often the state and community public schools, that are required by mandate to accept either a high proportion of high school graduates or all graduates are not able to offer special options to minority students. Since high school rank is a dominant factor in admissions, minority graduates often face a special problem. In some schools, students are admitted without designation of a major, so that making the admissions decision is procedurally difficult. Eleven schools in the survey have this policy (see 3, 8, 13, 25, 26, 27, 29, 31, 32, 38, 39 in Table I of Appendix). In spite of this, a significant proportion of program personnel are involved in the admissions process at various levels and provide a potential for affecting the admission decision.

Schools with other policies usually have special requirements for minorities, such as reduced admissions standards for aptitude and achievement test scores and for high school units in math and laboratory science. New Jersey Institute of Technology, for example, employs an entirely separate admissions technique for minorities. The minority program recruits the students, offers admission, provides financial aid, and notifies the institution's admissions office.

In eight of the schools, the student admissions documents flow through the regular system, and in the process each application is routed through the minority engineering program office for advice and counsel (see 1, 2, 5, 8, 9, 18, 23, 39 in Table I of Appendix). Though the regular decision-making body retains authority for the final selection, considerable weight is given to the recommendations of the minority program manager.

Waivers of admission fees are often available, but large quantities of paperwork are required and, in the end, may be self-defeating. For such waivers are usually based on income guidelines, but minority status is sometimes used as the criteria. Waivers are granted by the institutional admissions office or the minority program office.

Throughout the admissions process, a prime need is to simplify the maze of paperwork. Students often become discouraged by the red tape and carbon copies and lose their enthusiasm for higher education as well as for engineering careers.

Conditional Admission

Colleges employ several techniques to ease the transition of students into an engineering curriculum. For example, conditional admissions are offered, contingent upon satisfactory summer school performance or satisfactory completion of a summer pre-co-op program. Some schools ascribe "pre-engineering" or "special student" status to programs that enable students to become academically qualified for admission. Many private and a few public institutions allow students five years to complete a regular four-year course. The reduced academic load -- four courses instead of five per semester -- enables students to work and contribute financially to their education or provides more time to improve academically. (Refer to 1, 2, 6, 9, 15, 18, 30, 38 and 43 in Table 1 of Appendix).

Parent Conferences

During the admissions process, conferences are arranged occasionally with parents to inform them of the opportunities and requirements involved for a son or daughter in engineering school.

Admissions Factors

Performance and achievement in high school or a special program is usually considered more significant than aptitude test scores. However, admissions committees also weigh such factors as motivation, interest, and attitude in determining a student's potential for completing an engineering program. In this assessment, regular admissions forms are used in addition to information provided by teachers, employers, church leaders, community center advisers, and coaches.

Financial Aid Procedures

Chapter II describes several financial assistance procedures. Moreover, minority engineering program managers need to be involved in this operation, because the allocation of aid occurs concurrently with admissions. When industrial or foundation funds are available specifically for minority engineering students, the program manager has a key role in the assignment and distribution of funds.

Chapter 8

PRE-MATRICULATION SUMMER PROGRAMS

Summer programs are of key importance to many of the formal college efforts to assist minority students. Most summer programs are designed to improve the opportunities for success of students previously identified, recruited, and admitted. Others employ the program as an additional evaluative device.

Nearly 40 percent of the schools in this survey conduct summer programs. All commended the programs as worthwhile for many students and absolutely essential for others. However, a systematic evaluation, comparing the progress of summer enrollees to non-summer program enrollees, occurs quite infrequently, possibly due to the newness in these activities.

Program Participants

Most schools select students who appear to be in need of academic assistance to attend summer sessions. This usually means about 50 percent of the admitted minority students. A small number of schools virtually require the attendance of all new freshmen, as is the case with programs at the New Jersey Institute of Technology and the University of Bridgeport. Student participants are generally selected upon the recommendation of teachers and counselors. North Carolina A & T University operates a unique summer program conducted entirely by mail and at no cost to the students. The program involves mathematics review and practice in solving engineering problems.

Program Structure

The sessions usually run from four to six weeks and are conducted on the engineering college campus. The content of most activities is strictly academic, although some colleges have added several orientation elements in the summer sessions.

Two schools, the University of Bridgeport and Wayne State University, supplement the summer program with a work experience that is designed to line up the students with potential co-op relationships. At the University of Bridgeport students spend four hours a day on campus and work the remainder. Wayne State conducts four weeks of full-time campus study, followed by four weeks of full-time employment.

Program Content

There are three major types of program content: (1) mathematics and science subjects; (2) mathematics and science learning techniques and processes, and (3) a miscellany of learning skills, techniques of "survivorship," and basic orientation. Many programs contained only the first element initially, but with experience the second was adopted. In this case, instead of reviewing physics or chemistry, the learning experience focuses on the process of mathematical and scientific learning. However, students are provided with specific courses in subjects not taken in high school.

Another facet common to summer sessions is student exposure to the practice of engineering and the fields of engineering through seminars, plant visits, and lectures. Counseling is carried on formally and informally in every program.

As a transition technique, Drexel University attempts to stimulate as closely as possible the full-time fall program in the summer session. In some instances the sessions serve as a final screening mechanism to determine if students can qualify for matriculation. Most schools, however, find the degree of success for students in the freshman year correlates with the esprit de corps that develops during the summer session.

Program Funding

Summer program funding has been provided through industry and foundation sources. Some of the more established programs are building regular institutional funding into this aspect of their minority activities. Most cost components include room and board, instructional services, stipends for general living expenses, transportation, and some compensation for a summer job that the student would have held if not for the session.

Cost of instruction may be minimal if contributed or absorbed as time utilized for existing budgeted faculty or personnel. Program costs for instruction may be very steep if full tuition costs are to be paid by the program. Most programs gain some subsidy through a combination of tuition waivers, contributed faculty time, or waiver of overhead.

Compensation for a summer job is an exceedingly important consideration. If a student is normally expected to earn money during the summer, perhaps to help the family, these unrealized earnings should be added to the regular financial aid package.

Chapter 9

SUPPORT PROGRAMS

Some 80 percent of the colleges in the survey maintained support programs for minority students. Virtually all the respondents emphasized that post-matriculation academic assistance is imperative to the success of the programs, fostering the quality and quantity of minority engineering graduates.

Various techniques of support have evolved concurrently with the initiation of minority programs. Experience with this approach has indicated that adequate support activities should be developed before embarking on a minority program.

Support programs are intended to assist students throughout their course of study, but as it turns out, most of the resources and commitment are devoted to the first two years. The primary reason for this is that most students do not require extensive support services after the sophomore year.

Support activities usually possess the following objectives:

- To improve academic course success.
- To introduce learning skills related to study habits.
- To introduce and teach academic skills related to analytical processes.
- To provide academic guidance.
- To provide training in "survivorship".
- To facilitate personal adaptation to the campus environment.
- To introduce techniques in conflict avoidance.

To achieve these objectives, minority programs have adopted the following:

Tutoring

Most of the institutions provide tutoring of some type, usually focusing on course content, though some "skill building" occurs. Tutors are often student peers and sometimes upperclassmen or graduate students. While local industrial concerns provide tutoring personnel at certain schools, faculty members rarely engage in the practice.

Peer tutors are often paid from funds provided through the Department of Health, Education, and Welfare, the Veterans Administration, college work-study programs, schools, and industry. The University of Illinois has committed 10 percent of the time of its graduate assistants to minority tutoring.

One of the major questions associated with tutoring is determining if the student requires short or long-term help. What's more, student learning problems rarely are analyzed in terms of what tutoring can and should achieve. To complicate the situation, the extent of tutoring tends to be regulated by the hours the tutor can devote, rather than by the specific needs of the student.

Course/Curriculum Motivation

For some students, colleges have developed "stretched" courses to help compensate for inadequate secondary school preparation. For example, a calculus course given three hours a week may be extended to five hours, a two-semester calculus requirement to three semesters. A student may be allowed to carry four courses instead of the normal five per semester.

Serving commuting students, some schools do not prescribe a certain number of credit hours, allowing a curriculum to be open ended instead. Students are encouraged to take a course load that does not overburden them. By reducing academic loads, the employment needs of the student may be facilitated and additional study time may be provided.

Most remedial course work seems to take place during summer sessions rather than in support programs. However, schools often include remedial courses as part of the regular programs, including less rigorous than usual engineering courses.

Counseling and Advising

The minority program director often serves as the chief adviser/counselor, even when other counseling activities exist. Effectiveness is enhanced when the director is a minority person. Most program managers indicate that regular institutional counselors were not as successful with minority students because they were not completely aware of the problems associated with an engineering program for minority students.

Student peers may be formally organized to advise and counsel in some schools; in others, the approach is informal. Counseling in this context concerns course election, identification, and obtaining academic guidance and assistance with financial and personal problems.

To facilitate social and cultural adjustment on predominantly white campuses, some schools have explored sensitivity sessions for minority students. Other college minority programs regularly conduct group sessions that concentrate on student problems related to family background and campus environment.

Student Transfers

An especially difficult counseling problem arises when it becomes apparent to teachers and counselors that a student is not making satisfactory progress and should possibly pursue an alternative to engineering. Program administrators generally agree that to permit a student to continue in the program for an extensive period is as much a disservice to the student as failing to provide sufficient opportunity to succeed. The decision to drop a student is not an easy one at best, and it is usually measured by the student's overall progress, rather than the quality of work in a particular course.

Upon making a decision to drop a minority student, the problem is posed of how to further assist the student. Some schools believe transfer to another institution is appropriate, while others advocate the pursuit of a non-engineering curriculum within the same institution. In either case, no sure-fire methods have been devised for assisting the student through this painful readjustment.

Minority Student Groups

Particularly helpful to support programs has been the formation of minority student organizations on many campuses. In addition to sharing in various support activities, they offer minority students a sense of identity and belonging. An inter-college association of these groups would further enhance their effectiveness and serve to focus attention on the increasing number of minority participants in engineering.

TABLE II

SOME SCHOOLS CONTAINING VARIOUS
SUPPORT PROGRAM MECHANISMS
(See Table I in appendix for key
to reference numbers)

TUTORING	3, 7, 10, 15, 21, 23, 26, 27, 28 30, 37, 39, 46, 51
COURSE/CURRICULUM MOTIVATION	1, 3, 5, 6, 9, 13, 15, 18, 27, 28 32, 41, 43, 46, 47, 48, 49
COUNSELING AND ADVISING	3, 7, 10, 15, 21, 27
STUDENT TRANSFERS	10, 15
MINORITY STUDENT GROUPS	27, 39

Chapter 10

RETENTION: MEASURING SUCCESSES AND FAILURES

Because most minority programs have been implemented too recently, their impact on retention and graduation rates have not been studied systematically. Only nine schools reported comparisons of dropout rates among minority and regular students, three indicated the progress is comparable, and three others found minority progress below that of the regular students.

Individual colleges noted marked differences from one year to the next in the success rates of minority students and indicated that these differences occurred inexplicably, even though improvements were being made in the programs. For two colleges, the lack of progress could be explained. Neither school had minority program staff or adequate support activities. Their experiences further supported the hypothesis that post-matriculation support is essential.

While it is also too early in these programs to detect consistent patterns of retention practice, a number of factors noted by the colleges need to be evaluated and applied in minority programs. These include:

- Success may be measured in terms of grade point average, "persistence," "survival," and/or graduation.
- Persistence or survival often is a more significant goal than achieving of high grade point average. While these obviously are related, a solid "C+" grade point average for a high proportion of students is viewed as a measure of success than higher grade point averages for a smaller proportion of students.
- Grade point averages are regarded as having some measurable relationships to standardized tests. On the other hand, persistence is viewed as being related to factors such as personal motivation, financial aid, family relationships, and institutional environment.
- A number of colleges were concerned with academic policies relating to re-admission by students who were dropouts as a result of inadequate academic performance. However, none of the schools reported explicit strategies for re-admission. They attempted to avoid re-admission by preventing suspension, relying instead upon re-entering the student almost immediately, acknowledging the suspension criteria and attempting to provide an intervening mechanism to improve the students skills; and by transferring the student to another unit of the school.

- Bi-cultural instruction and/or counseling is available at schools in some of the Spanish-speaking areas of the country. One school expressed the strong opinion that bi-lingual instruction in the engineering courses is not the answer to a bi-cultural student population. However, bi-lingual advising, counseling, tutoring, and other support activities are considered important and productive.

Chapter 11

FINANCIAL AID PROGRAMS

Student financial aid practices are diverse and vary markedly among different states, schools, and even classes within the same school.

Funds are derived from a multiplicity of sources that include institutions, engineering colleges, co-op industrial organizations, foundations, state and federal grants in the form of scholarships and stipends, tuition and fee waivers, loans, and employment. Funds are administered by the university and/or engineering college, co-op offices, and sometimes by granting agencies.

Despite this multiplicity of funding methods, the acquisition of sufficient funds to carry on the programs continues to pose problems. For many schools, there are scarcely enough funds to meet the needs of resident students, and inequities exist for commuting students who need to work as well as study. Some students sometime work from 20 to 24 hours a week while attempting to attend college full time. There is a definite need to supplement these "self-help" efforts.

While various financial aid arrangements have not been analyzed in this report, the following observations come from the survey:

Co-op Programs

Invariably scholarship aid is related to co-op programs. In cases where first-year grants are available to students, co-op earnings often are expected to take care of all their needs thereafter. Program managers agree that co-op aid is an important part of the total minority engineering program, but they indicate that it should not become the predominant financing method. They viewed this as discriminatory, because minority students would be required to earn a disproportionate share toward their education, while others enjoyed work-free grants and loans.

Private and Public Institutions

Students attending private colleges generally require substantial funds in order to meet the inexorably rising costs. As the need increases so does the complexity of the financial aid picture. Costs at public institutions, by contrast, are lower and the financial aid problems are simpler.

Fund Sources and Distribution

Minority financial aid programs are generally integrated with institutional aid programs. Engineering colleges usually have an input into the assignment of regular institutional funds and can tap these sources for discretionary uses. These funds provide a means for such needs as increasing the number of minority students, providing medical and tutoring expenses, and so on.

Merit Awards

One general category of merit awards encompasses most of the co-op programs in which eligibility criteria is not based on need (see schools 3, 15, 33, 37 and 44 in Table I of the Appendix). Other merit awards, ranging up to \$1,000, are based upon prior academic excellence in high school or two-year colleges. These provide start-up grants for students to meet their first-year financial needs and cover tutoring costs. Nearly all minority students need funding to meet most of their educational costs, and merit awards, despite the implications of the term, are usually awarded to needy students, with some regard for academic potential.

Family Finances

Minimum contributions toward educational costs are expected from low-income parents. Family financial circumstances, however, often prevent minority students from attending college, because the total income is usually reduced when the student no longer contributes earnings to the entire family.

Fund Raising

No single ideal pattern for fund raising emerges from this survey. Extensive efforts have been made by some colleges in soliciting large sums from industrial and philanthropic sources. In these cases, funds have been obtained to support financial aid and program costs. Some companies and foundations provide unrestricted grants for minority programs. The minority engineering programs at the University of Texas, Pratt Institute, the University of Michigan, and the University of Missouri are among those schools that have been eminently successful in acquiring funds from various sources.

Chapter 12

PREDOMINANTLY BLACK SCHOOLS OF ENGINEERING

By far the majority of Black engineers have attended six predominantly Black colleges of engineering. Only since 1973 have all the other engineering colleges granted degrees to Blacks in numbers comparable to those six colleges. The six are Howard University, North Carolina A&T, Prairie View A&M, Southern University, Tennessee State University, and Tuskegee Institute.

As illustrated in Table III of the Appendix, these schools still represent 30 percent of all Black engineering freshmen. With additional funds, this percentage could be increased significantly. The predominantly Black schools have the capacity for substantive increases in their enrollments. The programs of these schools have been effective primarily because of the following unique advantages:

- The students share common traditions, so that there is no need for a special minority program.
- Minority faculty and staff are on hand for advice and counseling as well as to serve as role models, spurring students to achieve excellence.
- The transitional problems from high school to college are reduced because the need to adjust to a predominantly white institution is not applicable.

Although hampered by limited financial resources, these schools have responded to the nation's need for an increased minority engineering effort. However, recruiting for the predominantly Black schools has proved as difficult as for predominantly white schools. Visits to hundreds of secondary schools, timely dissemination of information, and use of CEEB mailing lists and NSSFNS conferences are integral parts of a successful identification program. These schools also use summer programs to upgrade the academic status of students and to provide opportunities for the successful completion of their education. The schools have added staff to expand the recruitment program and to spur freshmen to complete the critical first year. Retention is a primary problem facing these schools. Having pace-setting Black students in class often motivates other students to greater effort and achievement.

Finally, program administrators in these schools observe that better student understanding of the entire range of financial resources available makes

it possible to retain Black men and women by enabling them to deal with the pressing problem of support that most of them confront in earning degrees.

PART II: SUMMARIES OF INDIVIDUAL COLLEGE MINORITY ENGINEERING PROGRAMS

COLLEGE OF ENGINEERING
THE UNIVERSITY OF ALABAMA
University, Alabama

MINORITY ENGINEERING PROGRAM

This college's minority program centers exclusively on Black students because there are few Spanish surname and American Indian families in the area. Although a significant number of Black students are not taking part in a special program, all have received scholarships or other financial aid. Most of them had decided to enter the field of engineering as a result of some vigorous recruiting and educational programs that the college has instituted in the predominantly Black high schools of the region.

During the past two years, Black students have constituted 10 percent to 11 percent of the freshman class in engineering. A variety of remedial programs are available for students who show a need on the basis of their high school records and a battery of placement tests given to all entering freshmen. Specialized counseling services and tutoring also are available to all students and are not separate programs for Black students.

In addition to customary scholarships and other financial assistance from a variety of sources, the college has a special group of students who are receiving scholarships funded by grants from Alcoa, General Electric, and Monsanto. These students, many of whom were leaders in their respective high schools, are carefully selected as peer models. The idea was to locate Black students who were leaders in both scholarship and extra curricula activities and attract them to the study of engineering. It is expected that their choice of engineering as a career will influence other students to follow their lead. Assessment of the success of this idea will take two to three years, but preliminary results have shown its merit.

In the interim, all possible avenues are being utilized in order to introduce Black students to the opportunities in engineering available to them. For example, among 1,500 youngsters attending a recent open house for high school students, roughly half were Black. Of about 700 students enrolling in engineering in fall 1974, 70 were Black, including, for the first time, three Black women.

COLLEGE OF ENGINEERING
THE UNIVERSITY OF BRIDGEPORT
Bridgeport, Connecticut

ENGINEERING FOR DISADVANTAGED YOUTH (EDY)

The college's EDY program seeks out minority students in the Bridgeport area, attempts to motivate them to pursue engineering studies, and provides academic enrichment to enable them to matriculate. Once enrolled, students are offered tutoring and provided personal attention in motivating them to attend classes and compete scholastically.

Students are sought by program staff through various ways. Visits are made to high schools and discussions held with principals, advisers, chairmen, and with teachers in mathematics and science departments in order to identify potential candidates, particularly those with three or more years of college-preparatory math. Conferences are then held with the students to explain the risks and benefits of engineering as a profession.

The enrichment process takes four hours a day, five days a week, through seven weeks of July and August. Within this period the student is provided remediation in reading and comprehension, mathematics, and physics, and introduced to computers. During the summer program, students are encouraged to take advantage of tutoring. Every effort is made to enroll the student who completes the program either on the campus, at another institution, or at a job commensurate with his or her accomplishments and desires. Those completing the program successfully are awarded an official certificate attesting to their accomplishment. In the future the college intends to make this available to at least 50 percent of the students and will expand the summer program to six hours a day over a period of eight weeks.

For those who decide to matriculate all tuition and fees are covered by this program during the freshman year. In each case the officers and tutors in the program pay particular attention to the student on a daily basis and conduct weekly meetings with the entire group, at which attendance is mandatory. By careful tutoring, experience has shown it has been possible to motivate individuals with SAT scores averaging 650 so that they complete their university work with Q.P.R.'s in excess of 3.0 (on a scale with 4.0 equaling all A's).

After the freshman year is completed, each student moves into the cooperative education phase of education and is allowed to earn sufficient money to pay for tuition, books, and some other necessities. If performance is adequate, the student earns a degree at the end of five years in a specific area of engineering or in a related field such as biomedical engineering.

LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA
Berkeley, California

MATHEMATICS, ENGINEERING, SCIENCE ACHIEVEMENT (MESA)

Over the past five years, the MESA program has worked with minority high school students in a special effort to develop engineers and scientists. The goal of the program is to identify promising young students in grades 9 through 12 who state a desire to pursue engineering or science in college and to provide them as much recognition and support as possible.

The program is sponsored by the Lawrence Hall of Science at the University of California in Berkeley. It was started by a group of eleven concerned citizens, Black and White, who raised an initial \$10,000. This group serves as the advisory board for the program. University students work part-time as coordinators; other persons associated with the program volunteer their time.

The MESA program is designed to create student awareness of the personal satisfactions and national importance of careers in the sciences and engineering. It seeks to encourage and reward academic achievement.

The program offers academic tutoring at high schools, provided by adults who are working in technical fields. In addition, appointments are made for students to meet with engineers and scientists on the job. Both counseling and how to apply to college and general career guidance are provided individually. Students participate in monthly field trips to colleges and corporations in order to observe technical and scientific projects. What's more, several nearby corporations offer summer jobs.

As a means of acknowledging successful performance, the program rewards student academic achievement with scholarships. Those students maintaining a B average in college preparatory subjects receive a scholarship of \$50 a month. For some students this scholarship eliminates the need for afterschool or weekend jobs, so that they can devote more time and effort to studies. The scholarships are awarded on a monthly basis by the mathematics teacher. This particular aspect of the program is considered significant.

More than 20 students have graduated from the program and are now in college. Based on student reports, their performance is satisfactory.

SCHOOL OF ENGINEERING
CALIFORNIA STATE POLYTECHNIC UNIVERSITY
Pomona, California

MINORITY ENGINEERING PROGRAM

The present enrollment at Cal Poly's School of Engineering includes 100 students who are Black or bear Spanish-surnames. In 1974 the school graduated five Black students and an undetermined number with Spanish-surnames with B.S. degrees in engineering.

The school has concentrated on supporting the Chicano and Black engineering student groups. These two student organizations have been active in tutoring and assisting minority students at Cal Poly. The dean's office has worked directly with these groups and has allocated funds to some needworthy students for obtaining special tutoring.

In the 1973-74 winter quarter Cal Poly started an orientation class for Black and Spanish-surnamed engineering students. This class, taught by a Chicano engineering professor, offers information relating to the opportunities, salaries, and long-range prospects of engineering careers and introduces participants to the techniques of problem-solving, test-taking, and study methods.

SCHOOL OF ENGINEERING
CALIFORNIA STATE UNIVERSITY
Los Angeles, California

MINORITIES IN ENGINEERING PROGRAMS

Cal State's School of Engineering at Los Angeles has developed a program for minorities in engineering consisting of orientation, special advisement, continued evaluation, tutoring and cooperative education. The cooperative education program, which began in the spring of 1974, provides students with a choice of working three months in industry followed by three months in class or in alternating six-month periods. Evening courses are provided to students wanting to continue their education during their work periods. The cooperative education program has improved student motivations, particularly among minorities.

During the fall of 1973, the School of Engineering admitted 15 of the 20 students recruited by the LACBPE.* A summary of this experience follows:

	<u>Number of Students</u>
Recruited initially	18
Added later	2
Total Considered for Program	20
Qualified for Regular Admission	0
Approved for Special Admission	15
Attended Orientation	11
Accepted and Registered, Fall Quarter	9
Continued in Winter Quarter	7
Continued in Spring Quarter	6

(Note: One student dropped out in the winter and returned in spring. Two students changed their major in the spring, one to business and the other to home economics.)

Financial Aid

Application fees were waived for four students, and eleven more had their fees paid by a corporate grant. One student was granted a testing fee and

* Los Angeles Council of Black Professional Engineers

another the registration fee. In addition, five students qualified for financial aid from the Equal Opportunity Program.

Counseling and Tutoring

All students were invited to an orientation meeting and provided with individual counseling. Periodic checks have been made on their progress. Students were introduced to officers of the Council for Black Engineering, Math and Science Students. This group advised the new students, provided a tutorial program, and held special meetings to reinforce student interest. The Engineering Honor Societies also provided tutorial services.

General Comments

Most students lacked adequate preparation in math and science, received poor grade averages in high school, and scored low on ACT or SAT tests. When students took a mathematics placement test, none qualified for engineering mathematics. As a consequence, all were admitted to preliminary algebra courses to reinforce their backgrounds.

With regard to admissions, letters were sent and telephone calls made to remind the students to submit the necessary forms and records.

SCHOOL OF ENGINEERING
CALIFORNIA STATE UNIVERSITY
Long Beach, California

MINORITY ENGINEERING PROGRAM

This Cal State School of Engineering at Long Beach has a minority program that started in 1967-68 when it began to seek minority students through orientation visits to community colleges in the university's service area. In 1968, the School of Engineering assisted minority students in forming MESA (Minority Engineering Student Association), a highly visible campus organization. It has provided MESA with office space, assisted the group in attracting new minority students, and worked with those already enrolled.

In 1969-70, two civil engineering faculty members served on the Los Angeles Section ASCE Education Committee and assisted in job and college placement for 35 minority students from high schools in the central Los Angeles area. During the period 1970-73, the school concentrated its efforts in the area served by the university, communicating with high school and junior college representatives and speaking to community groups. In 1972-73, the school began to work with the Human Resources Development (HRD) Committee of ASCE - L.A. Section, the Los Angeles Council of Black Professional Engineers, and Rockwell International. It participated in seminars and planning sessions of the HRD & LACBPE and developed a working relationship with the Community Interface Program of Rockwell International.

With Rockwell International, the University's Office of Student Development Programs, and the departments of mathematics, chemistry, and physics, the school established instructional and tutorial programs for minority students. In 1972-73, a special section of the freshman engineering orientation course was used by Rockwell International to provide individual instruction for minority engineers. In 1973-74, two of the experimental courses became CE 100A&B, Pre-Engineering Studies, and were offered as required courses. The third course, EE 100E, Introduction to Engineering Problem Solving, will become a regular course. The School of Engineering has encouraged and aided the four engineering honor societies in conducting tutorial programs.

In the fall of 1973, the LACBPE invited 18 prospective engineering students from minority backgrounds to visit the campus. The school was able to admit 10 of the students and direct others to community colleges. Those admitted were placed in regular or special sections of classes already scheduled, and through the year an effort was made to retain the students.

Recognizing that it will be working with more "qualifiable" than qualified minority students, the school has developed a Minority Engineering Student Program in the Office of the Associate Dean and has enlisted the aid of three Black and Mexican-American students to promote the program.

SCHOOL OF ENGINEERING
CALIFORNIA STATE UNIVERSITY
Northridge, California

MINORITY ENGINEERING PROGRAM (MEP)

The Minority Engineering Program (MEP) was begun at Cal State at Northridge in the spring of 1973. The program seeks qualified high school graduates and provides them with special support to increase their chances of success in engineering or computer science.

To qualify for the MEP program, a student should have successfully completed high school mathematics at least through plane geometry and attained an overall grade point average of 2.5 or better. The recommendation by a science or mathematics teacher is required; it should indicate the student's potential for more advanced work in these subjects. Students demonstrating financial need may qualify for financial aid.

It was anticipated that the majority of students accepted into the MEP program would lack the preparation to enter the engineering program, due primarily to insufficient background in mathematics and science. During their freshman year, therefore, these students took special courses in pre-engineering, including a course related to orientation and motivation. A strong program in remedial science and mathematics was provided through courses in physical science, pre-engineering chemistry and physics, advanced algebra, and trigonometry. In addition, freshman engineering courses in Environment and Technology, Introduction to Design, and Introduction to Computing were required of all students, as well as a course in written and verbal communication. Moreover, required "general education" courses were added to complete a full-time course load (approximately 16 units).

Because of the remedial nature of a number of the courses taken the first year, approximately one additional semester is required to complete the requirements for the B.S. degree in engineering. All students were individually advised, and those demonstrating adequate skills and knowledge were exempted from some or all of the remedial courses.

During the first year, all MEP students were enrolled in a special engineering course. The purpose of this course is to assist the student in making the transition from secondary school to engineering school.

The students' progress was closely monitored during the first year of study. The results of the evaluation were discussed with each student and efforts were made to correct deficiencies.

A study room is available to all minority engineering students. Extensive tutoring is provided in this room on a regular schedule, primarily by graduate students in engineering. Voluntary tutoring is provided by the engineering honorary society, Tau Beta Pi, and the student Engineering Society. Thus, some

50 man-hours of tutoring is available each week to MEP students.

Summer jobs provide an excellent opportunity for the MEP student to gain professional knowledge and experience in engineering. These jobs are arranged through the program by direct contact with industry and with assistance from the Los Angeles Council of Black Professional Engineers.

CARNEGIE INSTITUTE OF TECHNOLOGY
 CARNEGIE-MELLON UNIVERSITY
 Pittsburgh, Pennsylvania

THE CARNEGIE-MELLON ACTION PROJECT (C-MAP)

The Carnegie-Mellon Action Project, an educational unit of Carnegie-Mellon University, provides academic and supportive services to minority students.

The overall objective of C-MAP is to aid Carnegie-Mellon University in its efforts to assure that a technical-professional education is acquired by motivated minority students who have demonstrated academic potential. This objective is carried out by the C-MAP staff by assisting university personnel in such admissions program elements as recruitment, selection, and financial aid; by providing a high quality pre-college experience (through the August Program) for entering students, and by providing academic and inter-personal support services throughout the school year.

Admissions

Although the recruiting effort is nationwide, a majority of the students reside within a 350 mile radius of the university. The selection procedure consists of two screenings -- the first to determine achievement potential and the second to determine motivation. The students are screened by university counselors, faculty, and administrators having expertise in the development and implementation of educational programs for minority students. The final decision to admit or reject a student is made by the university's admission office, using information derived from the screening process.

Students applying for financial aid receive assistance based solely on need as determined by their parents' economic status (documented in a confidential statement submitted by the parents at the time of application for aid).

August Program

All minority students are urged to participate in the August Program. The goals of the program are to:

- Acquaint students with the academic pace and assist them in meeting the demands of C-MAP through specific academic courses;
- Teach students to use the cognitive and physical resources of the university such as professors, other students, libraries, study skills center, academic and psychological counselors, and tutors;

- Help students recognize the need for developing sound study plans and strategic approaches to different subjects, and
- Assist students in the enhancement of their positive self-concepts and feelings of being able to perform well in the environment while maintaining a realistic attitude about their ability and the effort required to perform satisfactory.

Supportive Services

The demands of the August Program give rise to the need for effective counseling. This is carried out in a one-to-one situation during the program. Counseling is geared toward the development of personal and interpersonal skills in order that students may meet the demands of the campus environment.

During the academic year, the counseling staff employs the group approach in which students meet in small groups with a professional group facilitator and two upperclass student co-facilitators for approximately 90 minutes on alternate weeks. At the end of August, an educational plan is developed for each student, using data derived from the student's academic performance and potential.

SCHOOL OF ENGINEERING
CASE WESTERN RESERVE UNIVERSITY
Cleveland, Ohio

BLACK ENGINEERING OPPORTUNITIES PROGRAM

A new program has been launched to increase the number of talented minority students preparing for an engineering career at Case Western Reserve University. Features of the plan include a modified cooperative education approach with industry, continuing grant-in-aid to the students, special academic work at Case before the student enrolls and special course sections and counseling. The program is designed to maximize student motivation, raise the potential for academic success, and guarantee financial support.

Every industrial participant sponsors one or two new students each year. The companies provide each student with:

- A meaningful engineering job starting with the pre-freshman summer and continuing through each succeeding January inter-session and summer, as long as the student is in good academic standing and progressing satisfactorily in the engineering program;
- A \$1,000 grant-in-aid during each of the first two years, and
- A \$2,000 grant-in-aid for each of the last two years and for an additional semester or year if needed to complete the degree. This aid can be in exchange for participating in a company-sponsored project that the student pursues for course credit.

The grants-in-aid involve a company commitment of \$12,000 a year under steady state for two new students a year or \$6,000 for a program with one student per year.

In this program the university is committed to:

- Arrange the remainder of the funding required by the student, taking into account the financial position of the family;
- Provide extra academic preparation to make up for insufficient background in sciences, mathematics, and English;
- Recruit and counsel qualified students and ensure matriculation in order to maximize the likelihood that they will successfully complete their programs of study, and
- Recommend students whose interests are compatible with the needs of sponsoring companies and arrange transfers within the program when a student's interest change.

The program is equally applicable to students transferring from a community or junior college to the CWRU engineering school. The work experience, company advice and counsel, extra preparatory study, and project opportunities are all designed to develop motivation, practical engineering know-how, and various skills, as well as an ideal educational program.

SCHOOL OF ENGINEERING
CLARKSON COLLEGE OF TECHNOLOGY
Potsdam, New York

Summer programs offering pre-engineering education and career orientation to American Indians are being conducted annually by the Clarkson School of Engineering.

The programs are designated for students from the Mohawk, Seneca, Onandaga, and Tuscarora nations living in Upstate New York and are supported by grants from corporations and foundations. The 1974 academic program consisted of two courses in mathematics and two in engineering -- all but one taken for college credit. Students were limited to a choice of one of the four courses. The career orientation course provided a two-week introduction to college life, centering upon careers in science, engineering, and management.

Courses are conducted by the Clarkson faculty, with the assistance of American Indian counselors and engineers who provide insight and information on careers in engineering.

At the end of the 1974 program, several of the 25 students (including 16 women) indicated an intent to pursue careers in either engineering or technology.

SCHOOL OF ENGINEERING AND APPLIED SCIENCE
COLUMBIA UNIVERSITY
New York, New York

MINORITY ENGINEERING PROGRAMS

This school actively recruits minority students. The admissions office conducts numerous open house programs and seminars for high school students, teachers, and guidance counselors during the school year. In particular, students from inner city schools are urged to attend a film about the university, its students, faculty, and programs, featuring Columbia students from various racial and ethnic backgrounds.

The university's work-study program engages eligible students in the School of Engineering and Applied Science. Eligibility is based upon need. The students work part-time in offices on the campus.

Financial aid is awarded on the basis of need, and minority students receive a very high proportion of it. Tutorial assistance and counseling are available at no charge.

One particular program is directed at minorities. Sponsored by Bell Laboratories, this scholarship program for minority students covers expenses at the school and provides summer jobs with the research center. The scholarships amount to about \$6,000 each. Since 1972 when the program began, 12 awards have been provided to students attending Columbia's Engineering School, and additional Bell Lab scholarships are provided at other engineering schools. They are designed to encourage outstanding minority students and women to enter the engineering profession. Recipients are selected from among talented youths who intend to study in the fields of mechanical, electrical, or computer science engineering. Eligibility is limited to students at engineering schools in areas where Bell facilities offer summer job programs. These facilities are in Denver, Colorado; Chicago, Illinois; Indianapolis, Indiana; Columbus, Ohio; Atlanta, Georgia; Greensboro, North Carolina; Newark, New Jersey; and New York City.

SCHOOL OF ENGINEERING
UNIVERSITY OF CONNECTICUT
Storrs, Connecticut

MINORITY ENGINEERING PROGRAMS

The School of Engineering employs the Minority Graduate Student Locator Service to recruit minority graduate engineering students. The service is operated by the Educational Testing Service of Princeton, New Jersey, in conjunction with the Graduate Records Examinations Program. Letters are sent to aspiring candidates based on their indication of interest and an assessment of their qualifications for graduate study.

A second recruitment effort is directed toward Black high school seniors who ranked as semi-finalists in the National Achievement Scholarship Test for outstanding Negro Students. Letters are sent to these individuals, along with a brochure describing the programs of the School of Engineering.

The school participates in the ECPD Minority Engineering Education Effort. Computer lists of minority high school students interested in engineering are used to direct letters and brochures to hundreds of prospective undergraduates. These listings are provided by the College Entrance Examination Board and are distributed via the Minority Engineering Education Effort (ME³).

The university sponsors several programs directed toward increasing the enrollment of minority students, although these programs are not specific to engineering.

The School of Engineering is currently launching a new program of Recruitment and Disadvantaged Students for Careers in Engineering, funded under Title I of the Higher Education Act of 1965, Office of Education, Department of Health, Education, and Welfare. Federal funds total \$20,280, and the institution provides matching funds of \$10,166. The program has two primary phases: First, a recruitment effort will be conducted within the State of Connecticut by faculty of the School of Engineering. Meetings with high school guidance counselors are arranged to inform minority students of career opportunities in engineering. Also, an attempt is being made to foster the development of engineering clubs within urban high schools and an engineering design project competition is planned. Follow-up meetings between groups of minority students are held at urban high schools. The second phase consists of the development of a co-operative work/study program for minority engineering students. It is intended that the period of alternating work and study semesters will cover four calendar years, during which the work of the first two academic years will be completed.

COLLEGE OF ENGINEERING
CORNELL UNIVERSITY
Ithaca, New York

PROGRAM FOR MINORITY STUDENTS

Of some 2,200 students enrolled in the College of Engineering undergraduate program, 155 are currently in the Program for Minority Students. Efforts are being made to increase the proportion of minority participants. Because some minority students are deficient in preparatory work, the College offers special programs to enable them to succeed in their studies and prepare for professional careers.

Among the available support services is an orientation program, offered during the summer before freshman matriculation and designed to strengthen skills in mathematics and science. During the regular academic year, special advising and counseling services are offered in coordination with the university's Committee for Special Educational Programs (COSEP). Tutoring and other assistance are available as needed on an individual basis.

In addition, two programs are framed to help orient the students to engineering as a profession. One brings practicing minority-group engineers to the campus for a special series of lectures and discussions. The other provides sophomores with the opportunity to participate in on-the-job industrial experience for a short period between academic terms.

Admission of minority-group students is based partly on academic performance in high school and on scores received on college entrance examinations and achievement tests. Test scores are analyzed in terms of the applicant's environmental background. Subjective information obtained from Cornell alumni, school guidance counselors, community agency personnel, and other concerned individuals is also considered.

Substantial financial assistance, in the form of scholarships and loans, is available to minority students.

COLLEGE OF ENGINEERING
UNIVERSITY OF DELAWARE
Newark, Delaware

MINORITY ENGINEERING PROGRAM

As part of a state-wide effort co-ordinated by the Delaware Program for Minority Engineers in cooperation with Delaware State College and the Wilmington public school system, the University of Delaware's College of Engineering provides an active program for minority engineers. The program is focused on the identification and recruitment of qualified Black students in the Delaware public school system, but it is not restricted to Delaware residents.

Upon high school graduation, students in the program are encouraged to attend a Summer Academy on the university campus. This summer session provides academic and social orientation to the campus and the college. It is conducted concurrently with the regular university summer sessions and utilizes that particular university program. While the needs of individual students vary, most are enrolled in mathematics and English courses.

After matriculation in the fall semester program, students continue to receive regular counseling from their advisors as well as tutorial assistance when needed. There are no restrictions on the types of programs the students may select within the College of Engineering.

Special aspects of the program:

- There has been strong engineering faculty and university administration backing for the program.
- Financial support and representation on the executive committee of the Delaware Program for Minority Engineers come from both the participating academic institutions and area industries.
- Financial aid is readily available to academically qualified students. Aid includes tuition, books, room and board, a monthly stipend, and payment for tutorial assistance. Aid is available for all academic sessions at the university.
- The recruitment portion of the program is on-going, and the college works closely with guidance counselors and teachers in the public school system in an attempt to identify and recruit eligible minority students.
- Counseling and tutorial aid is emphasized. Students are encouraged to see the program advisor and their academic

advisors on a regular basis. Lists of qualified tutors are maintained and tutors are assigned to the students whenever the advisor thinks help is needed.

COLLEGE OF ENGINEERING
DREXEL UNIVERSITY
Philadelphia, Pennsylvania

MINORITY ENGINEERING PROGRAM

Drexel's program concentrates on the academic preparation of selected educationally disadvantaged students in the areas of engineering and science. This is carried out primarily by way of an intensive remedial pre-college experience of eight weeks duration. Summer courses are offered in pre-calculus, preparatory chemistry, remedial English, reading, and elementary computer programming.

The summer program simulates Drexel's freshman year schedule in the sense that a student is exposed to lectures, recitation classes, hourly and final examinations, research papers, and homework.

Supportive services, including tutoring, advising, and counseling, are available, but made mandatory where deemed necessary. Seminars on study skills and career opportunities are held weekly.

During the academic year all these services are continued for the engineering and science majors and initiated for the incoming business and home economics majors. Tutorial services are available to any Drexel student who needs them.

Recruitment

Since 1969 the college has been developing a recruitment program for potential engineering and science majors among disadvantaged students. The first effort, which was funded by the university, was a motivation, application, and preparation program for selected West Philadelphia area students in the tenth and eleventh grades. The university has been participating since 1971 in a motivation program operated by the Philadelphia school district. It is aimed at exceptional high school seniors to enable them to attend the college of their choice. Drexel operates a continuing education program for the parents of disadvantaged students as part of its minority recruitment effort and an engineering mathematics program for selected eighth grade students in Philadelphia.

Counseling

Counseling concentrates on the freshman student in the belief that if a student completes the freshman year, there is a good chance of graduating. On the average a total of 80 freshman students are serviced by the staff counselor and student counselors. There are also many upperclassmen who seek out the

services of the counseling staff.

Tutoring

The Tutorial Center is open to all students who experience some difficulty in coursework and request help. Approximately 100 students attend the tutorial center each term. The majority of the students participate on a regular basis, while others take part only when they need assistance. Some students require mandatory tutorials, which means they can have from two to seven hours of tutoring per week. Many students taking mandatory tutorials manage to stay abreast or ahead of their classroom work.

The tutors are Drexel students and graduate teaching assistants who have shown success in their coursework. Tutors work from three to fifteen hours per week and are paid according to their classification from \$2.00 to \$2.50 per hour. The graduate teaching assistants are in charge of the help sessions given once a week in courses dealing with problem solving and are paid \$3.00 per hour and \$7.50 per hour for help sessions.

COLLEGE OF ENGINEERING
UNIVERSITY OF FLORIDA
Gainesville, Florida

MINORITY ENGINEERING PROGRAM

The College of Engineering has a 3/2 program with four predominantly Black institutions. These include Edward Waters College, Bethune Cookman College, Florida Memorial College, and Florida A & M University.

Students from these colleges study at the University of Florida for a semester. Usually, two or three students per year go into engineering. Incentive awards of \$100 are given to entering Black freshmen who are interested in engineering.

The school has written to all Black students in the State of Florida who have taken the Scholastic Aptitude Test (ME³ program), as well as all Black students referred by ME³, and encouraged them to consider the University of Florida engineering program.

The university also has provided support and encouragement to the newly founded Society for Black Student Engineers. This organization is involved primarily in recruitment activities.

GENERAL MOTORS INSTITUTE
Flint, Michigan

PRE-ENGINEERING AND MANAGEMENT (PRE-EM) PROGRAM

GM's Pre-Engineering and Management (Pre-EM) program is a non-degree educational program designed especially for disadvantaged high school graduates, both male and female, whose academic qualifications prevent their entrance in an established degree program. The main objective of Pre-EM is to provide students the opportunity to improve or complete their academic qualifications for admission to a five-year college program in which they can prepare themselves for full-time employment with their sponsoring GM units.

The duration of the program is one year (two semesters of 24 weeks each); however, depending upon academic performance, the student may be qualified to enter the degree program after the first semester. The program is conducted on the cooperative plan of education in which the student spends alternating six week periods in studies at GMI unit.

Every third week a progress report is made on the student's performance in the program by each instructor. At the end of six weeks the progress report is sent to the sponsoring GM unit, which aids in the development of a counseling or tutoring program for the student during the work experience period.

Formal tutoring classes are available during the academic periods at GMI in mathematics, chemistry, and physics as well as all other Pre-EM subject areas on an informal basis.

During the six week periods of work experience (four per year) at the sponsoring GM unit, each student earns more than \$4 per hour, or approximately \$4,500 per year before deductions, providing the student with substantially more than the expense of the program.

ATLANTA UNIVERSITY CENTER COLLEGES
AND THE
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia

THE DUAL DEGREE PROGRAM

The Dual Degree program combines the resources of two Atlanta educational complexes -- the Atlanta University Center, the largest cluster of private colleges in the United States with a predominantly Black enrollment, and Georgia Institute of Technology. As part of this program, students attend one of the four undergraduate colleges in the Atlanta University Center for three years, then transfer to Georgia Tech for an additional two years. Upon successfully completing the program at both institutions, the student simultaneously receives two degrees -- a Bachelor of Arts or Science awarded by the affiliated Atlanta University Center college the student attended and a Bachelor of Engineering Degree from Georgia Tech. The second degree may be a Master's at Tech or a Bachelor of Engineering Technology awarded by the Southern Technical Institute, a division of the Engineering College at Georgia Tech.

The program began its fourth year in September 1972 with a total enrollment of 164 students, 57 percent of whom are from outside the state of Georgia. The projected enrollment for 1975-76 was 400 students.

During the 1973 winter term, there were ten full-time Dual Degree Students studying at Tech and five others taking courses at both Tech and an A.U.C. college. The first graduates completed their engineering degrees in the spring and summer of 1974. Two of the first ten were candidates for the Master of Science in Engineering degree.

The initial financial support for the Dual Degree program was a \$265,000 grant from the Olin Charitable Trust Fund. These funds were expended over the first three years. Since then, a much wider base of support has developed as the program has grown. Many firms and agencies are also supporting the students through summer employment.

Initiated at Georgia Tech in 1954, the Dual Degree program is an outgrowth of the Three-Two Plan in Engineering. That year Tech joined five colleges in offering students the opportunity of studying at Tech for a baccalaureate degree in engineering along with a liberal arts degree from their original colleges.

The Dual Degree program offers the student a means of obtaining a very broad education by attending two colleges with distinctly different educational emphasis -- one, liberal arts, the other, science and engineering. It enables some students to vary their college experience in other ways. These include studying at two colleges of different size, studying at a church-related college and a public college, living in a large city while attending one college and a smaller community while attending another, and living away from home for

part of the college experience and residing at home for the other part. For some students the plan offers a realistic means of meeting the demanding academic requirements of a technological university after having been denied proper high school preparation.

DEPARTMENT OF ENGINEERING
HARVEY MUDD COLLEGE
Claremont, California

MINORITY ENGINEERING PROGRAM

All students are recruited for a common lower division program. They do not choose their major fields until the middle of the sophomore year. For this reason, minority students are sought who will complete the common core requirements, then make an individual choice among four degree fields, including engineering, chemistry, mathematics, and physics.

The college's admissions officers are continuously seeking qualified minority students. They are assisted by Black and Chicano admissions officers who support the recruitment efforts of all five undergraduate colleges in the Claremont group. "Qualified" means for all students a majority of A-grades in the high school programs, which include pre-calculus mathematics, chemistry, and physics, as well as an aptitude score of 600 or higher. It is the responsibility of the Dean of Admissions to admit the best qualified applicants. Those admitted may receive financial aid based on need.

Various supportive services are available. One such service is a placement office which assists students in obtaining summer employment in their field of concentration. The Black and Chicano Studies Center also offer counseling programs.

SCHOOL OF ENGINEERING
HOWARD UNIVERSITY
Washington, D.C.

OFFICE OF STUDENT SERVICES

Howard University's School of Engineering formally established the Office of Student Services in July 1973 to assist its engineering students in solving the problems they encounter in engineering education. Concurrent with this basic objective is the development of recruitment and academic programs at the college and pre-college levels that will facilitate the influx of students into engineering programs, as well as aid in their retention and ultimate graduation.

Some basic functions and programs, many previously performed within the School of Engineering, have been identified as being necessary to accomplish the stated objectives. These are:

Recruitment

Recruitment activities are usually implemented through a committee consisting of faculty, students, the counselor/financial aid administrator, and the school recruiter. The committee works closely with high schools in the local area, primarily through school visitations and career days. Beyond its area, it uses student lists supplied by the National Achievement Scholarship Program, the American College Testing Program (ACT), the National Scholarship Service and Fund for Negro Students (NSSFNS), and the Engineers' Council for Professional Development. It also utilizes referrals from high school counselors and Howard students and alumni.

Financial Aid

Recruitment is dependent upon financial aid. Currently about 98 percent of the students request financial aid and about 50 percent need full support. Approximately 30 percent are receiving aid in the form of loans. Incoming freshmen receive more financial aid than any others since many young, new students have no other means of support.

Counseling

Counseling efforts are devoted to the identification and solution of student problems. These encompass the following: (1) academic deficiencies, (2) inadequate financial support, (3) social/personal adjustment, (4) lack of

esprit and sense of community and (5) misunderstanding of the objectives of engineering education and the university education system.

Retention/Tutoring

Retention is the goal of the tutorial program. It consists of identifying those courses that present the most difficulty to students, selecting undergraduate and graduate students to serve as tutors, and scheduling tutorial sessions that are compatible with course schedules. Student tutors who are not on scholarships receive hourly wages for their work.

Cooperative Education

The Cooperative Education for Engineers program, now in its eighth year, has grown at a steady rate. It serves as a vital tool in the areas of recruitment, financial aid, counseling, and retention and, therefore, greatly complements other efforts in these areas.

Pre-College Engineering Enrichment and Orientation

Efforts to motivate and provide early engineering exposure to pre-college students have been supported with a two-year grant-in-aid by the Alfred P. Sloan Foundation, a one-year grant by the Engineers' Council for Professional Development and two one-year grants by the Atomic Energy Commission. The funding has enabled the college to initiate a multi-level program. By familiarizing students with various engineering disciplines, it enables them to obtain a clear picture of the profession's many facets. In all cases the students receive actual intellectual challenges in the fields of engineering, math, and the physical sciences. The program is divided into the following sub-programs:

- Workshop for Local Junior High Students. The workshop is presently designed to be administered to 50 students during a three-week, four-hour per day period during the summer.
- Minority Introduction to Engineering (MITE) for High School Students. Two separate programs for 30 high school juniors and 40 seniors is administered during a two-week period. All participants reside on campus during the program with room, board, and travel provided.
- Pre-Freshman and Cooperative Education (PREFACE). The program is currently administered to approximately 25 pre-freshman students who have been accepted into the School of Engineering at Howard University. The program consists of a two-week on campus engineering enrichment/orientation period and a six-week employment session at an industrial site. A stipend is paid each participant for the entire eight weeks. Enrollment in the Cooperative Education Program is normally pursued by at least 50 percent of the participants. Financial support, consisting of at least tuition is guaranteed to all participants for the freshman year.

COLLEGE OF ENGINEERING
UNIVERSITY OF ILLINOIS
Chicago, Illinois

MINORITY ENGINEERING PROGRAM

The College of Engineering at Chicago Circle, along with the Educational Assistance Program,* has made a concerted effort to increase the minority enrollment in engineering. At the center of the program is the Assistant to the Dean for Minority Students, who holds a joint appointment with the College of Engineering and the Educational Assistance Program. Both administrative staffs offer full support to the goal of increasing enrollment and providing supportive services for inner city students.

The program operates in the following way:

The College of Engineering realized that in many cases minority students from the inner city lack the established admissions criteria for engineering. Hence, the assistant to the dean spends a significant portion of his time visiting inner city high schools in an effort to identify those students who demonstrate an interest in the field of engineering, but, because of their scholastic backgrounds, would be rejected. Others who have the background may not pursue engineering because of their limited knowledge of it as a career. These students are carefully screened and their credentials are evaluated to determine if they possess an aptitude for engineering and to identify the deficiencies in their backgrounds that need to be overcome.

Once the student enters the College of Engineering the assistant to the dean becomes his academic advisor. The student is helped in selecting courses, obtaining financial aid, and adjusting from high school to college life. The assistant to the dean exposes the student to engineers and engineering environments through industrial tours, guest speakers, seminars, and, when possible, meaningful summer and part-time jobs.

On campus there is the Association of Minority Engineers (AME), a student organization with the assistant to the dean serving as its faculty advisor. This organization was formed to provide students with a feeling of cohesiveness and a sense of direction. The goals of the Association are:

- To successfully complete a degree program.
- To collect and disseminate relevant information.
- To establish communication links between students, faculty and administration.

* The Educational Assistance Program is a program designed to recruit and provide supportive services at Chicago Circle for local students from the Metropolitan Chicago Area.

- To provide the social and cultural impetus in obtaining the above and then aggressively seek employment.

Directed by the assistant to the dean and the Association of Minority Engineers is a Minority Engineers' Tutoring Laboratory, provided by the College of Engineering. Here the student may obtain assistance in mathematics, chemistry, physics, and any of the engineering science courses. The Lab is staffed by junior and senior minority engineering students who are members of the AME. In addition, each department in the College of Engineering has contributed 10 percent of its graduate assistant's time to the Tutoring Laboratory for students in advanced courses. The Tutoring Laboratory is understandably a focal point for minority students. It serves as a study hall, meeting place, and a place for gathering and exchanging information.

COLLEGE OF ENGINEERING
UNIVERSITY OF ILLINOIS
Urbana, Illinois

MINORITY ENGINEERING PROGRAM

Since 1968, the University of Illinois has made special efforts to identify, motivate, and educate a larger proportion of minority students in engineering.

First, a Summer JETS (Junior Engineering Technical Society) Program for inner city youth was established. This program was designed to identify potential engineering students in their junior year of high school, invite them to the campus for two weeks during the summer, expose them to engineering orientation, and encourage them to pursue the profession. The first group consisted of 10 students in 1969; the number has risen since then to more than 40. Follow-ups indicate that approximately 70 percent of the students enter engineering schools.

A second effort, the Education Opportunity Program, was initiated in 1968. Presently, 40 engineering students are enrolled in this program, which helps diagnose any weakness in the potential student and begins to strengthen that weakness prior to enrolling in the regular curriculum. Since the student may have adjustment problems also, a graduate assistant is assigned to work with the student and serve as a motivator.

Finally, with the cooperation of the Black Engineering Students' Association (BESA), an inner city bus program to the Engineering Open House was begun in 1972. The students were brought in by the BESA for a day-long tour of engineering exhibits and a program relating to the accomplishments of practicing minority engineers. This program has attracted about 1,200 minority students to the campus.

Illinois' College of Engineering has launched new projects and expanded successful programs aimed at minority students through an assistant dean and a half-time graduate assistant. In addition, two quarter-time graduate assistants are assigned to minority freshmen in the Educational Opportunity Program. The staff provides educational counseling and engineering guidance along with program coordination and development.

COLLEGE OF ENGINEERING AND PHYSICAL SCIENCES
ILLINOIS INSTITUTE OF TECHNOLOGY
Chicago, Illinois

MINORITY PROGRAMS IN ENGINEERING

The overall minority effort is a combination of five programs in one. The primary focus is on early identification of prospective interested students during the high school junior year and pre-co-op work experience during the summer following graduation from high school and during the freshman year (as opposed to regular co-op work experience which typically follows a successfully completed freshman year).

The five coordinated activities in the program are:

1. High School Visitation takes several forms:

- A staff member visits minority high schools and contacts counselors, describing the IIT program and suggesting how it may appeal to students interested in mathematics, science, or management.
- A high school counselor invites potential students with apparent interests in engineering to attend a special meeting with IIT staff.
- An IIT staff member talks with students, describing engineering and management career potentials and the IIT program.
- After a screening determines the students that may profit from the program, IIT personnel interview the students, parents, and high school counselors.

2. Saturday Program for High School Juniors: Academic subjects relating to theory and tools (including math and communications) are utilized in a laboratory experience. This includes specific hands-on opportunities to build a box camera, telescope, musical instrument, and analog computer.

3. Six-Week Summer Pre-College Program for High School Juniors: Included are a two-week academic program and a four-week period for developing interpersonal relationships (informally known as "Survival Tech"). The academic program comprises a design and construction contest in bridge building and digital clocks, using project team concepts. In the component on interpersonal relations attempts are made to develop written and oral communication skills, as well as listening abilities. In doing this, the school uses special films, Toastmasters International volunteers, professional industrial college recruiters familiar with co-op programs, and specialized industrial training programs relating to communicative skills. Another component provides eight extensive site visits to nearby industrial plants, ranging from manufacturing

through research and development. In addition, each student is given a battery of guidance tests to assist IIT in analyzing each student's maximum potential for development during the six week program and in serving as a basis for Item 4 below.

4. College Counseling: Each summer student is personally interviewed by a member of the IIT admissions staff who discusses the student's academic record and evaluation of the student's performance during the Summer Program, in particular the implications of both for admission to the desired college. The students seeking admission to IIT and satisfying its criteria are informed about their admission status at that time, subject to appropriate development during the senior year in high school.

5. High School Senior Year: All junior students, who have become associated with any part of the overall program, are invited to participate in a special Saturday session aimed at developing academic excellence in the student's senior high school year. This includes special help in the student's regular program and access to enrichment materials to maintain developing interests.

SCHOOL OF ENGINEERING
UNIVERSITY OF KANSAS
Lawrence, Kansas

STUDENT COUNCIL FOR RECRUITING, MOTIVATING
AND EDUCATING BLACK ENGINEERS (SCoRMEBE)

SCoRMEBE is a student-controlled organization which has been responsible for the continued support of the minority engineering program at the University of Kansas since the 1970-71 school year. Although staff support has increased during the past two and a half years, program participants (members of the parent organization) are still primarily responsible for fund-raising, student recruitment, and program staffing liaison with faculty and administrators, as well as the planning, implementation, and evaluation of program activities.

Unlike many minority student programs at predominantly white universities, SCoRMEBE students are not under the administrative auspices of a "general" university program, such as Minority Affairs and Affirmative Action for Black Studies. The entire program, including financial aid, academic advisement, tutorial, and study-skill development activities, is a part of the School of Engineering.

Students are accepted into the program on the basis of interest in engineering, recommendations from high school counselors and teachers, and grade point average, with major consideration given to the student's interest in engineering.

Efforts have been undertaken to expand the program by including the Spanish surnamed and Native Americans. In addition to visiting high schools and Indian reservations, program staff have consulted with Spanish surnamed students through the Department of Minority Affairs at Wichita State University. Haskell Indian Junior College, which is located in Lawrence, represents a significant source of Native Americans.

The SCoRMEBE program is divided into two parts: (1) the SCoRMEBE Summer Program and (2) the regular academic year program. Both programs have a director, support staff, and two faculty advisors. In both it is the responsibility of the director to solicit funds from interested industrial corporations, recruit students for summer and fall activities, and generally oversee the day-to-day operation of the program.

In general special services are provided for both programs, which are designed to facilitate successful adjustment in a major university environment and to aid in the alleviation of problems relating to: (1) poor high school preparation in math and the basic sciences, (2) low verbal skills (reading, writing and oral presentation), (3) poor mechanical skills (graphics and computation), and (4) faulty study habits.

During the summer, special courses are offered in sliderule calculation and computer programming. Students are enrolled in mathematics and basic science courses offered as a regular part of the university's summer program. The program for each student is planned, and each academic status is determined through a special arrangement with department chairmen. Participants in SCoRMEBE audit the classes of their choice and are expected to take part through classroom discussions, homework, and all exams. At the end of a course, each student may elect to receive credit for the course. If a student elects not to take credit, record of the course will not appear on the transcript. For those high school students with college credits before graduating, there is a great sense of accomplishment. This serves as a powerful motivating factor.

Special housing arrangements, tutors, and counselors have proven important to successful adjustment. Because a basic understanding of engineering in a highly technological society is important, several seminars are held in which industrial and university personnel make the case for strong participation by minority engineers. Career counseling has been augmented by these seminars and by informal meetings. Seminars, social functions, and informal meetings are integral to the summer and academic year programs. Thus, the 1972 summer program concluded with an awards dinner for participants and their families.

During the regular academic year, special advisement, counseling, and tutoring services are provided as needed and all students are encouraged to participate in SCoRMEBE activities. Individual financial awards are based primarily on established need during the regular academic year. A cooperative summer job placement program has provided practical experiences and financial flexibility for matriculating SCoRMEBE students.

SCHOOL OF ENGINEERING
LAMAR UNIVERSITY
Beaumont, Texas

MINORITY ENGINEERING PROGRAM

The Department of Chemical Engineering at Lamar University has a vigorous identification and recruiting program for minority students qualified for and interested in chemical engineering. Largely through the assistance of the local chemical industry, the recruiting program has taken two major forms -- scholarships and co-op education.

Each year Dow Chemical of Freeport, Texas, provides the department with unrestricted funds, which may be used for freshman scholarships. What's more, \$500 is added by Dow for each qualified minority student that is recruited. Presently, the \$500 is sufficient to pay for books, fees, and tuition for the fall and spring semesters of the freshman year. The Monsanto Company of St. Louis, Missouri, also provides the department with unrestricted funds for freshman scholarships.

The second form of recruiting involves a special cooperative education program for minority students. Each participating company has variations in the method of implementation. The E. I. DuPont de Nemours and Company, Inc., of Orange, Texas, for instance, provides one or two minority students with a co-op position at its plant. DuPont personnel contact the high schools, primarily in Orange, screen the students, and select the participants. DuPont also provides summer employment to students upon graduation from high school.

The Diamond Shamrock Corporation of Deer Park, Texas, provides a co-op position for a pair of minority students. This is combined with a tuition remission plan, with Diamond Shamrock refunding 75 percent of the tuition of the previous semester(s) at the beginning of each co-op work period. Summer employment upon graduation from high school is available to students who are at least 18 years of age. Should students take permanent employment with Diamond Shamrock after graduation as engineers, the company will refund the remainder of their tuition. All recruiting for this program is done by Lamar personnel.

The Monsanto Company at the Chocolate Bauou Plant provides one co-op position which accommodates two minority students. No other stipend or compensation is provided. For one of the students in this program, a \$500 Monsanto Company scholarship was provided from its unrestricted fund. Recruiting for this program also is by Lamar staff.

COLLEGE OF ENGINEERING
UNIVERSITY OF MARYLAND
Eastern Shore, Maryland

MINORITY ENGINEERING PROGRAM

The engineering program of the University of Maryland, Eastern Shore, offers students an opportunity for improving their essential skills, while developing a firm engineering foundation in preparation for entrance to the College of Engineering.

Students entering the UMES Engineering Program study under the guidance of a faculty with experience in the education of disadvantaged people. The program features small sized classes, a mathematics enrichment program, a science enrichment program, and an introductory program to industry.

The program of the College of Engineering covers three years and allows students sufficient time with industry to gain practical experience in engineering, while earning money for tuition and fees. Upon entering the college, students may elect course work in aerospace, agricultural, chemical, civil, electrical, and mechanical engineering, as well as in fire protection. In pursuing these opportunities, all students are encouraged to use the tutorial services of the College of Engineering. Although the courses are sometimes difficult, the student devoted to becoming an engineer can, and eventually will, succeed.

COLLEGE OF ENGINEERING
UNIVERSITY OF MARYLAND
and
FROSTBURG STATE COLLEGE
Frostburg, Maryland

DUAL DEGREE PROGRAM

A cooperative program between Frostburg State College and the University of Maryland College of Engineering is now available to the student who seeks to pursue a career in one of several engineering fields. This new dual degree program allows a student to earn undergraduate degrees from both participating institutions over a five-year period.

The program provides that an undergraduate student will attend Frostburg State College for approximately three academic years and the University of Maryland College of Engineering for approximately two academic years. After completing the academic requirements of Frostburg State, usually by the end of the first year at the University of Maryland, students will receive a bachelor's degree from Frostburg State. Upon meeting all the requirements in the College of Engineering, students are awarded baccalaureate degrees in engineering by the University of Maryland.

To become a dual degree candidate at the University of Maryland, a student must have satisfied all specified requirements at Frostburg State College. Additionally, the student must have the following:

- Minimum cumulative 2.0 grade point average at Frostburg State College.
- Recommendation from the designated official at Frostburg State College.

Admission to the College of Engineering at the University of Maryland is guaranteed to the Frostburg State College dual degree student providing these requirements have been satisfied.

SCHOOL OF ENGINEERING
UNIVERSITY OF MASSACHUSETTS
Amherst, Massachusetts

ENGINEERING CAREER ORIENTATION FOR MINORITY HIGH SCHOOL STUDENTS

Initiated in the fall of 1971, the Engineering Career Orientation (ECO) program at the University of Massachusetts is a joint endeavor by the School of Engineering and the Black Scientist Society on campus.

The ECO program attempts to identify, motivate, and prepare minority high school students for an engineering education at the university. High school students are brought periodically to the university for seminars, laboratory demonstrations, workshops, and field trips to local industries. The purpose is to familiarize students with the field of engineering and to motivate them into the varied opportunities available for those with an engineering degree.

In addition, ECO has a three to four week summer activity in which a small group of students is invited to live on campus while participating in project-oriented engineering early in their high school careers. It is expected that students who are highly motivated will take the appropriate science and mathematics courses in high school and become prepared for entrance into an engineering curriculum.

COLLEGE OF ENGINEERING
THE UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

MINORITY OPPORTUNITY PROGRAM

In 1963 the University of Michigan began its Opportunity Program to recruit and assist students, particularly those from minority groups, who could, with assistance, successfully complete the academic program. In 1970, the university's Regents approved a goal of "10 percent enrollment of Black students and substantially increased numbers of other minority and disadvantaged groups" to be reached by 1973-74. To attain that goal, the Opportunity Program and other minority student services were enlarged in size and scope. In particular, financial aid was pledged so that no minority student would have to drop out for lack of funds to pay tuition, books, room, and board.

Even greater effort was needed for engineering students. By 1970 Michigan's College of Engineering had established a Minority Projects Office to offer services specifically for minority students to supplement university-wide efforts. Today, a full-time staff of three, aided by part-time tutors and counselors, coordinates recruiting, admissions, financial aid, tutoring, counseling, and job placement.

Since 1970, the minority students enrolling and graduating at the College of Engineering has more than doubled, and the numbers continue to grow.

COLLEGE OF ENGINEERING
MICHIGAN STATE UNIVERSITY
Lansing, Michigan

ENGINEERING EQUAL OPPORTUNITY PROGRAM

Michigan State's Engineering Equal Opportunity Program has been in operation for the past five years. The objective is to increase the enrollment and the retention of minority (primarily Black) students in engineering. From the inception, the program has been experimental in nature and flexibility has been maintained in order to meet the diversity of student needs.

The number of minority students enrolled in the program has grown from fewer than 10 in 1968-69 to more than 80, and the number of graduates is increasing.

Components of the program include:

Tutorial Assistance

Academic assistance is provided in mathematics, chemistry, physics and computer science. Junior and senior students from minority groups are paid to serve as tutors for freshmen and sophomores. Special attention is given to study skills. Close contact with students is maintained through frequent interaction, and feedback of academic progress is developed.

On-Campus Engineering Jobs

In addition to holding tutorial jobs, minority engineering students are employed as laboratory and research assistants, programmers and departmental aides, enabling students to become familiar with a variety of meaningful work experiences.

Seminar Services

Opportunities are provided for minority students to interact on an informal basis with leading Black engineers and educators throughout the country.

Visitation Trips

A 10-minute slide-tape presentation prepared by minority students provides the introduction for students to talk with students at junior and senior high schools about the opportunities for minorities in engineering.

Academic Advising and Counseling

A Black academic adviser and counselor employed by the college assist minority engineering students with academic, personal, and social concerns.

Black Students of Engineering

This is a student group that works cooperatively with the Engineering Equal Opportunity Committee to develop and implement some of the special programs, such as the seminar series, the school visitation activity, and the tutorial assistance program.

COLLEGE OF ENGINEERING
MICHIGAN TECHNOLOGICAL UNIVERSITY
Houghton, Michigan

MINORITY ENGINEERING PROGRAM

Michigan Technological University is located in the sparsely settled upper peninsula of Michigan where there are few residents who are Black or of Spanish origin, but a number of Native Americans live in the area.

The university has established an office on American Indian Programs that works with tribal councils and local agencies to coordinate services in which the university can appropriately be involved, including preparation, motivation, and scholarships for engineering study.

The college's Engineering Awareness program of high school visitation by faculty, students, and practicing engineers presents career guidance programs on the requirements and opportunities in engineering. The 1973-74 program was directed primarily at high schools in urban areas of Michigan, such as Flint, Saginaw, Bay City, Midland, and Grand Rapids. Several schools with large minority enrollments were visited by two Blacks, one male civil engineer, and one female electrical engineer, each with between 10 and 15 years experience. The Black engineers teamed up or were joined by a White male faculty member for visits to a total of seven schools and talked to more than 700 students.

INSTITUTE OF TECHNOLOGY
UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

PROJECT TECHNOLOGY POWER

This institute has three long-range projects to recruit additional low-income and minority students. These include Peer Teaching, Math and Science on the job, and Minds for Progress, which are explained as follows:

Peer Teaching

High school students are trained to teach mathematics and science to younger students one or two grade levels below their own. The teaching students serve as models and have been instrumental in stirring the academic interests of their peers toward college. Started in 1971, the program presently has 100 student-teachers instructing some 1,500 students in 75 classrooms within 15 inner-city schools.

The cost is approximately \$1,000 per peer teacher. This includes pay for regular teachers and university students who, after taking a special university course for credit, work with the peer teachers in a five-week summer program designed to train them how to teach and also meet with the peer teachers outside of class hours during the school year to prepare them on specific content.

Math and Science on the Job

Ninth and tenth graders and their math or science teacher work with a practicing engineer, architect, or scientist over the summer to devise a way of developing a major technical problem into an exciting classroom subject. The objectives are to familiarize the participants with the nature of technical problems and their solution and to enrich the curriculum with technically-oriented materials. The cost is under \$3,000 per teacher-student team.

Minds for Progress (MFP)

This is an organization of local architects, engineers, and scientists from minority groups who have developed their own programs for motivating inner-city youngsters. The Institute of Technology arranged the initial meeting which lead to the formation of MFP.

A short-range program is also provided. It calls for high-school visitations by institute faculty and students. High school students are also invited to programs on campus.

Out-of-state contacts developed by the Minority Engineering Education Effort (ME³) are pursued. The institute facilitates transfers from General College (an open-enrollment junior college on the university campus).

A few merit scholarships, providing for tuition, fees, books, room and board for two years, have been contributed by local firms.

Retention

The merit scholarship program is regarded as a means of retaining students once enrolled in the Institute. Students receiving financial aid based on need are granted a pure gift rather than the usual 2/3-gift, 1/3-loan if they agree to live in a dormitory-house (a floor of a dormitory in which a senior serves as a live-in tutor) for the freshman year.

Extensive tutorial services are available for all students, including those students receiving financial and/or academic aid from the "Martin Luther King Program".

Part-time jobs during the school year and full-time during the summer are arranged, usually in a technical environment relevant to the student's major.

New courses are developed with the intention of easing the transition for inadequately prepared students into the regular program. Thus, a self-paced pre-calculus course was introduced recently.

Administration

Because of the small numbers of students involved thus far, these programs have been operated almost entirely by a professor on half-time assignment to Project Technology Power. Institute funds exist for hiring a graduate assistant, but the position has not yet been filled.

The greatest amount of project costs are related to the Peer Teaching Program which is supported by the Bush, General Electric, General Mills, and St. Paul Foundations and by the state's Council on Quality Education. With the exception of salaries furnished eligible youngsters by the Neighborhood Youth Corps, federal funds are not used.

SCHOOL OF ENGINEERING
UNIVERSITY OF MISSOURI-ROLLA
Rolla, Missouri

MINORITY ENGINEERING PROGRAM

The Minority Engineering Program at the University of Missouri at Rolla is based on the premise that if minority students succeed in their first year, prospects for completion of their engineering training are high. Therefore, a major effort is made to provide students with the opportunities needed for adjusting to an engineering school, to make up any deficiencies, and to be free of financial problems during the first year.

This program begins with a six-week summer course during which students study mathematics, English, and developmental reading, and take a physics logic laboratory. Each course is pitched at the academic level of the students attending. In addition, seminars are held to describe job opportunities in various industries. Engineering department chairmen also describe the work done by graduates in different disciplines.

Students making satisfactory progress during the summer program may enroll in one of the regular engineering curricula at Rolla in the fall. The regular academic program includes tutoring, additional industrial seminars, and group activities. The total aid package for freshmen students is \$2,300, which covers tuition and fees, housing, and an allowance for personal expenses. During the first year every effort is made to obtain summer or co-op jobs for all participants, provide industrial experience, and help finance the second year. It is expected that each participant who desires a summer or a co-op job will receive an offer.

Students are assisted in applying for any scholarship and/or federal or state grants for which they are eligible. The federal and state grants are based on the student's family income level.

Tutoring and counseling services are available to students as they are enrolled in engineering at Rolla.

In the 1974-75 program 44 students were enrolled. Their academic performance in the first semester was much better than those of previous groups of minority students who did not have a special program. A larger group was planned for 1975-76.

Support for this program has been obtained from industry, the University of Missouri, and federal and state grants.

NEW JERSEY INSTITUTE OF TECHNOLOGY
(Newark College of Engineering)
Newark, New Jersey

ENGINEERING OPPORTUNITY PROGRAM

This Engineering Opportunity Program was initiated in 1968 with 20 Black students, all graduates of the Newark high school system. The program has expanded to a present enrollment of 150 students -- 85 percent Black, 10 percent Hispanic, and 5 percent White and Oriental. It is administered by two Blacks and one Puerto Rican, and it is funded through a New Jersey state grant, with supplementary industrial and foundation support.

The program's components and services include:

An eight-week summer preparatory program prior to the freshman year, including instruction in physics, mathematics, chemistry, and English, with college orientation, selective group guidance activities, field trips, and study skills.

- Financial Aid (state and federal support)
- Tutorial activities (voluntary and mandatory)
- Counseling activities (group and individual)
- Student activities
- Problem-solving seminars
- Community Advisory board
- Recruitment and admission activities
- Evaluation and feedback procedures
- Job placement

All students are educationally and economically disadvantaged. Their elementary and secondary preparation is initially inadequate for regular admissions without supportive services. The family income is usually less than \$10,000. Despite these disadvantages, the overwhelming majority of enrollees has succeeded academically and personally.

COLLEGE OF ENGINEERING
UNIVERSITY OF NEW MEXICO
Albuquerque, New Mexico

MINORITY ENGINEERING PROGRAM

An assistant dean and the director of Engineering Cooperative Education are responsible for programs of recruiting, orientation, counseling, and tutoring minority and women engineering students at the University of New Mexico. Another staff person may be added to support the over-all program, along with one more to undertake a special program for American Indians.

Recruiting focuses primarily on students in New Mexico. To this end, letters are mailed to each student whose ACT scores show an aptitude for engineering, and the students are urged to consider engineering as a career. In addition, the college and individual departments are developing contacts with schools and counselors, and faculty members frequently visit schools to inform students about engineering. Last year the assistant dean prepared a television series to foster college recruitment, and a booth was set up at the Navajo Tribal Fair.

The program is supported financially by college funds and grants from the Department of Health, Education, and Welfare and the Energy Research and Development Administration.

COLLEGE OF ENGINEERING
NEW MEXICO STATE UNIVERSITY
Las Cruces, New Mexico

DESIGNATED ACADEMIC OPPORTUNITY PROGRAM (DAOP)

This is a new program of industry scholarships administered by New Mexico State's College of Engineering, in addition to the other scholarship and co-op programs that are available to all students.

Participants are selected as Designated Academic Opportunity students during the senior year in high school. Financial assistance provided by participating companies varies. The minimum commitment includes in-state tuition for one year, nominally \$466 each, and a commitment for summer jobs following completion of the freshman year.

Each sponsoring company may specify that awards be made to students from a particular ethnic minority, for women, or for any student rurally or economically disadvantaged. Generally, students are selected from the upper one-third of their high school class and with a composite ACT score of at least 19.

The College of Engineering solicits support for this program from industry and upon receiving it, advertises the program to high school students, distributes and collects the application blanks, selects the recipients (if authorized to do so), provides special advising, and notifies the sponsors as to the academic progress of the participants during the academic year prior to the summer job. Coordination of the details for arranging the summer jobs is handled by the college, which includes assisting in the coordination of financial aid that may be provided under other federal programs for these students.

The university offers such tutorial programs as Special Students Services for disadvantaged youth and the three Ethnic Coordinators programs. The College of Engineering assigns special advisors to each of the Designated Academic Opportunity students to assist their selection of courses and to monitor their progress during the first two semesters. Follow-up advising is available to the students upon their return from the summer work experience and afterward upon request.

SCHOOL OF ENGINEERING
NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY
Greensboro, North Carolina

MINORITY ENGINEERING PROGRAM

This School of Engineering made a survey in the spring of 1974 to determine the obstacles and problems preventing minority students from pursuing a college education and, in particular, a degree in engineering. More than 4,000 students from high schools across the U.S. were asked to complete a questionnaire prepared by the Coordinator of Recruitment and Retention of Minority Students. The responses revealed that many students were confused about their career objectives. They had no idea about what field of engineering to choose or what area of engineering would parallel their own interests. Many students lacked adequate guidance, faced financial problems, and had poor academic preparation.

To help deal with these problems, a Summer Pre-Freshman Correspondence Program (SPFCP) was established in the School of Engineering. The program consisted of two elements -- a mathematics review and practice in solving engineering problems. The program was conducted entirely by mail, and there was no cost for the participating students. Some 100 students from several states were admitted to the program, and approximately 65 percent remained in the program.

The students were given individual attention and encouragement. Financial support was promised to those who were seriously interested in engineering as a career and who achieved outstanding results in their work. Many students had potential for success but for various reasons seemed to fear engineering education. This fear stemmed primarily from the lack of confidence in their ability to succeed.

The results so far have indicated that SPFCP was a successful program, and plans have been made to continue it in the summer of 1975. Many participants in the 1974 program have expressed their pleasure with it, and a majority of them credited the program with eliminating their confusions relating to career objectives. In addition, support for the success of the program was evidenced by a 25 percent increase in engineering enrollment for the 1975 fall semester.

SCHOOL OF ENGINEERING
NORTH CAROLINA STATE UNIVERSITY
Raleigh, North Carolina

ENGINEERING PROGRAM FOR BLACK STUDENTS

In an effort to increase its enrollment of minority students, this School of Engineering launched special pre-engineering sessions in 1973 for eleventh grade students. Two groups of 30 students studied on the campus of North Carolina State University from Monday morning through Friday afternoon during the spring semester. Of these, 14 were admitted to engineering programs in the fall of 1974. One other student enrolled in the School of Physical and Mathematical Sciences.

Recruitment has been expanded under the direction of a recent Black graduate who was hired as an assistant admissions officer and who spends much of his time in the field contacting prospective engineering candidates. Now 37 additional minority students have entered the school.

The minority program includes some funds for supportive services; however, many of the students face financial needs that are greater than the available funding.

COLLEGE OF ENGINEERING
NORTHEASTERN UNIVERSITY
Boston, Massachusetts

SCHOLARSHIP COOPERATIVE PROGRAM IN ENGINEERING FOR MINORITY STUDENTS (SCOPE)

The Scholarship Cooperative Program in Engineering for Minority Students (SCOPE) seeks to expand the educational opportunities for academically qualified Blacks, Mexican Americans, Puerto Ricans, and American Indians. The program offers full scholarships based on merit and/or need to qualified applicants. In addition, cooperative work assignments are provided at the end of the freshman year and during alternate quarters in the upperclass years. SCOPE provides guidance, free tutorial services, use of pocket calculators, and other support services to minority students in order that they may be assured an opportunity to succeed in their chosen field of engineering study.

Every effort is made to provide the SCOPE student a full financial aid package during the freshman year to alleviate the need for employment.

Programs of Study

The College of Engineering provides opportunities for undergraduate studies leading to the Bachelor of Science in the following areas of engineering study: chemical, civil (with an environmental engineering option), electrical (with power systems option), industrial, mechanical, and general (unspecified).

Admissions

Each interested student who applies for admission to SCOPE is considered on individual merits, talents, and achievements. In evaluating a student's academic record and potential, the following criteria points to the admissions decision:

- Graduation from an accredited high school and evidence of satisfactory work in an accredited college or on a high school equivalency test.
- Grade point average and rank in the upper half of the high school graduating class.
- Satisfactory scores on one of the following: College Entrance Examination Board Scholastic Aptitude Test and three achievement tests or American College Testing Program.

- Evidence of aptitude and a high level of preparation in the sciences and mathematics.
- For college transfer students, satisfactory academic record.

Financial Aid

Minority applicants qualifying for the SCOPE program in most cases are awarded full tuition scholarships. Several minority applicants receive full tuition, room, board, and books on the basis of academic achievement and/or need. The grants come from the Martin Luther King Scholarship Fund, major industries, and the university.

SCHOOL OF ENGINEERING
OAKLAND UNIVERSITY
Rochester, Michigan

MINORITY ENGINEERING PROGRAM

The Oakland University School of Engineering participates in two distinct programs aimed at increasing the number of minority graduates in engineering. Recruitment for these programs is managed through the Special Projects Office.

Cadet Engineering Program

The cadet engineering program is a summer program for high school students. Students are admitted in the summer, prior to entering the 10th grade, and are in residence at Oakland University for six weeks during each of four consecutive summers. There are monthly follow-up sessions during the academic year. The program promotes punctuality, attendance, note taking, and good study habits. The course material includes basic mathematics and science with engineering applications, and there is a large measure of hands-on experience involving various projects. The program first began in the summer of 1970 and the results have been very gratifying.

Pre-engineering Program

The second program accepts students who are high school graduates but have been academically disadvantaged and attempts to improve their skills to the point where they can compete with regular engineering students. The students enter the program in the summer, prior to their freshman year, and take courses in pre-engineering and remedial mathematics. Like cadet engineering, emphasis is placed on punctuality, attendance, note taking, and good study habits. Basic mathematics and science topics are covered with application to engineering problems. During the first semester of their freshman year the participants take a second course in pre-engineering along with additional mathematics and usually an introductory chemistry course.

The results of this program have not been as successful as the cadet engineering program. For a number of the participants, pre-engineering is "too little-too late". The solution proposed is to extend the program to cover more material over a longer period, but with the inherent disadvantage of extending the students' time in school.

COLLEGE OF ENGINEERING
THE OHIO STATE UNIVERSITY
Columbus, Ohio

AFFIRMATIVE ACTION AWARD PROGRAM

In January 1972 Ohio State's College of Engineering strengthened its minority recruitment program by initiating an Affirmative Action Award program. The program is intended to assist all minority students; however, due to the size and distribution of the minority population in Ohio, the greatest emphasis has been on Black high school students.

Initial funding for the program was provided by the Ohio State University Engineering Experiment Station. Subsequent aid has been received from various members of the industrial and government communities who have seen the merit and potential of the program.

In order to be considered for a financial award under the program, the minority high school student must satisfy the following criteria: attain a high level of scholastic performance in the mathematics and physical sciences and possess a strong desire to pursue an engineering career. In order to locate students of this caliber, the college utilizes the following sources of information:

- Recommendations from high school counselors, mathematics, and physics teachers.
- Recommendations from interested and distinguished Black alumni.
- National Merit Scholarship Corporation's list of participants in the National Achievement Scholarship Program for Outstanding Negro Students.
- Student profiles furnished by the Engineers' Council for Professional Development.

In addition, the college employs the talents of the members of the Black Undergraduate Engineering Council, a recently chartered organization in the College of Engineering. This group will aid in direct recruitment efforts in several local area high schools.

Some of the main features of the Affirmative Action Award Program are:

- Tuition and incidental fees are provided for the freshman year. For Ohio students this amounts to about \$800 per school year. Awards for the sophomore year depend upon academic performance during the first year and are independent of financial need.
- If the student requires further financial aid, it is available through regular university scholarship and financial aid sources.

- Special counseling and individual tutoring are available if required during the academic year.
- A Pre-freshman and Cooperative Education for Minorities in Engineering (PREFACE) Program is provided. The program includes pre-freshman employment in jobs related to engineering; pre-freshman counseling and tutoring to aid in the transition from high school to college; and summer employment in jobs related to engineering following the first, second, and third years of college.

DIVISION OF ENGINEERING, TECHNOLOGY AND ARCHITECTURE
OKLAHOMA STATE UNIVERSITY
Stillwater, Oklahoma

COUNCIL OF PARTNERS TO INCREASE BLACK GRADUATES

This Council is a consortium made up of 18 Oklahoma industrial concerns, five Black leaders representing public school systems and urban leagues, the director of the Oklahoma Human Rights Commission, and a university representative. It was created to provide equality of opportunity for the professional development of minorities in engineering, technology, and architecture.

The Council is governed by its members through an elected chairman and several standing committees which function as a working staff. For example, the Selection Committee chooses the students for the program. However, to maintain continuity, there are two full-time staff members -- a recruiter-counselor and a secretary-treasurer -- working under the OSU Division of Engineering, Technology and Architecture.

Recruiting

Initial identification and recruitment of students are responsibilities of the recruiter-counselor, who visits high schools throughout the state, works through the usual public schools' administration, and with Black professionals when available. Visits are preceded and followed by letters, telephone calls, campus visits, and recruiting and guidance literature. Final selection and commitments to students are made by the Selection Committee.

Pre-engineering Education

There is a summer preparatory phase serving a threefold purpose: (1) students enroll in remedial mathematics, science and communications; (2) students obtain motivation and career guidance through field trips to industry and talks by Black professionals, and (3) students who do not have the aptitude or interest in the fields of study are identified and channeled into other academic fields.

Remedial course work is continued by students as needed to raise the level of achievement required in their studies. No academic concessions are made for any of these individuals, nor do they expect or desire any.

Support

Financial support on an established need basis is provided through two sources: The primary one is the Oklahoma State University financial aids

program, funded in large measure by federal student loan and grant programs, which provides about 75 percent of the needs of the average minority student. Industrial partners initially provide the remaining 25 percent. After the freshman year each student must provide some portion of funding from savings earned during summer employment with the industrial partners. An industrial partner contributes \$2,160 for each entering freshman it sponsors. This sum provides the cost of the summer preparatory phase and 25 percent of the cost of the freshman year, as well as supplements aid provided by normal financial aid sources and the student's own contribution. Administrative overhead expenses are absorbed by the Division of Engineering, Technology and Architecture at Oklahoma State.

Academic-tutoring services are provided as needed, by one full-time tutor and four minority upper-division or graduate students. Tutoring is conducted in the dormitories at night and in classrooms during the day. A pace-setting minority student often spurs minority classmates to greater efforts and excellence.

The regular staff of advisors concerns itself with enrollment. A Black counselor does the personal and emotional counseling and holds group meetings at least bi-weekly, more often if needed. Career counseling and guidance is provided by the division's professional staff and by Black professionals who visit the campus frequently.

Retention Experience

In the summer of 1973, the division initiated the minority program on a trial-basis without external financial support. Of the 29 Black students who enrolled in the Summer Preparatory Phase, 13 subsequently enrolled for the fall semester. The remaining 16 dropped out for various reasons, most transferring to other colleges on-campus and off-campus.

An additional 12 students were recruited for enrollment in the fall semester, thus increasing the total to 25. Of these, 16 students successfully completed the academic year and enrolled in the fall 1974 semester. This 64 percent retention rate was very near to a projected retention rate of 68 percent.

In the summer of 1974, 30 students were enrolled in the preparatory program, and 21 of these subsequently enrolled for the fall 1974 semester. Nine more were added to maintain an enrollment of 30.

The division is enrolling minority students "as they are" when they graduate from high school. That is, while they are "qualifiable" in the necessary foundation courses of mathematics, science, and communications, they become qualified in these courses only after they arrive on campus.

SCHOOL OF ENGINEERING
UNIVERSITY OF THE PACIFIC
Stockton, California

MINORITY ENGINEERING PROGRAM

This school is a participant in the Minority Engineering Effort (ME³) and concentrates its recruitment efforts at both community colleges and high schools. The school of engineering staff conducts an annual visitation of the community colleges and talks with minority and women students interested in engineering.

At the high school level, the School of Engineering stages a two-day Institute. On the first day, high school teachers, counselors, and students convene on the campus of the University of the Pacific for a tour and lectures relating to engineering education. Students are then taken on tours of industrial companies to learn about careers in engineering.

COLLEGE OF ENGINEERING AND APPLIED SCIENCE
UNIVERSITY OF PENNSYLVANIA
Philadelphia, Pennsylvania

MINORITY ENGINEERING PROGRAM

The University of Pennsylvania's College of Engineering and Applied Science has recently undertaken a comprehensive program that ranges from identifying minority scholars as early as the junior high school level to preparing minority students for entrance into engineering graduate school. Thus, it is centrally concerned with recruiting minorities for undergraduate degree programs. In the past five years, enrollment of minorities has risen threefold -- currently 13 percent of the entering freshman class and 9.2 percent of the overall undergraduate body.

Activities which have contributed to this increase include:

Recruiting

The pool of potential minority applicants is surveyed by the university's Minorities Admissions Officer and personal contacts are then made by university faculty or alumni. Cooperative programs involving local industry, high schools, and area colleges aid in the identification of prospective minority engineering students, with special attention given to schools having large minority enrollments.

Pre-Freshman Skill Development Program

With the assistance of the Minorities Admissions Officer, students who need to develop skills in writing and mathematics are invited to attend a summer program preceding matriculation at the university.

Post-Freshman Minorities Tutorial Program

Held in one of the university's college houses during the summer following the freshman year, this program seeks to improve student skills in deficient subjects, such as math and science.

Individualized Advising

Each student at the college is given careful, individualized attention. In instances where personal tutoring or counseling is indicated, these are arranged from the resources of both the college and the university as a whole.

Assistant to the Dean for Minorities Programs

A Black graduate student in chemical engineering was appointed last year to assist in overall coordination of minorities activities. Through his office, additional tutors are recruited and special activities are arranged that help to integrate students into university life.

SCHOOL OF ENGINEERING
UNIVERSITY OF PITTSBURGH
Pittsburgh, Pennsylvania

MINORITY ENGINEERING PROGRAM

Operating under a grant from the state's Higher Education Equal Opportunity Act, Pitt's School of Engineering seeks to significantly increase the number of disadvantaged students in the field of engineering. The program is aimed at recruiting disadvantaged high school graduates capable of advanced study in engineering and tutoring and counseling these students when necessary.

The recruiting system has been improved and expanded. Today, lectures on engineering are presented at several high schools; many interviews are conducted; literature, including a brochure for Black engineering students, is distributed. Prospective minority engineering students are invited to the campus and introduced to the faculty, staff, students, and facilities.

In terms of long-range planning, efforts are directed at increasing the pool of potential minority engineering students. The project director is working closely with personnel from factions such as the Community College of Allegheny County, the Pittsburgh Public School System, and Westinghouse Corporation in order to develop programs which would direct additional minority students into engineering and other technical fields.

To provide pre-college experience, the program sponsors a four-week summer session that provides disadvantaged high school graduates with a preview of college engineering. The program entitled "Engineering Methods: An Introduction" has four principal objectives: (1) to help eliminate transition difficulties between high school and engineering school; (2) to provide insight into engineering as a career; (3) to aid students in learning the engineering approach to problem solving, and (4) to strengthen study habits in physics, chemistry, and mathematics. All students reside in the regular dormitories at the expense of the School of Engineering and participate in campus cultural activities. At the end of the program certificates of merit are presented to the qualified participants.

There is a two-week summer institute for Scientists of Tomorrow. This program is designed to provide insight for the high school student in the 10th and 11th grades into science and engineering careers.

Throughout the first year, the tutorial and counseling services made steady progress. The academic performance of most students in the program improved during the second term. Of the 18 students enrolled in the program, only four decided not to pursue engineering as a career.

Future plans call for the hiring of an assistant director and the sponsoring of in-service programs for administrators, faculty, students, high school counselors, and community persons.

SCHOOL OF ENGINEERING AND SCIENCE
PRATT INSTITUTE
Brooklyn, New York

ENGINEERING EDUCATION FOR MINORITY ENGINEERING CANDIDATES

A major aspect of the Pratt Institute minority program is the Repayment Educational Assistance Program (REAP), which covers tuition, fees, and expenses for entering minority engineering and science students in co-op programs. Pratt Institute awards 60 percent of the loan as a grant. The remainder of the scholarship must be repaid over a reasonable period after the student enters the working portion of the co-op program.

The first priority at Pratt is to recruit and develop minority group students who are prepared. This is achieved by recruiting candidates at junior and community colleges in the metropolitan area who have completed a two-year program with an A.A.S. degree in Engineering Technology.

The second priority is to establish a pre-cooperative education program where interested high school sophomores, juniors, and seniors are invited on campus for pre-engineering and pre-science education. Pratt also accepts students from the General Educational Development program who have equivalency diplomas and scores ranging from 269-310 (which is equivalent to a score range of 73-83 on a 100 point scale). Students are provided with summer employment opportunities in engineering fields where they can learn to adjust to practical working conditions. They are usually able to earn enough to meet personal needs during the summer.

In a current three-year pilot program, Pratt is receiving \$180,000 in support funds from the Alfred P. Sloan Foundation to alleviate the financial problems of minority engineering candidates. The present enrollment is approximately 150, including 25 freshmen, 50 sophomores, 50 juniors, and 25 seniors.

SCHOOLS OF ENGINEERING
PURDUE UNIVERSITY
West Lafayette, Indiana

MINORITY ENGINEERING PROGRAM

Several years ago, Purdue's Schools of Engineering recognized that one of the obstacles for minority students was completion of the first year at the university. A special Counselor-Tutorial Program was initiated therefore to assist educationally disadvantaged students in surmounting this barrier to academic success. Thus, many of the activities pertaining to the recruitment and retention of minority engineering students are the responsibility of the Freshman Engineering Department.

Although there is no extensive, formalized program for recruiting minority students, a number of activities aid in increasing the number of students enrolling in the Schools of Engineering. These included:

1. Invitational seminars have been held for about 120 science and mathematics teachers and counselors from Indiana high schools to provide information relating to careers in engineering. Many of these teachers were from predominantly Black schools. A small group of high school teachers from mainly Black high schools in the Gary-Hammond area met with members of the freshman engineering faculty to discuss methods for increasing minority interest in engineering.
2. Members of the Society of Black Engineers, which has been organized on the Purdue campus, have communicated with the high schools they once attended in an effort to increase student interest in engineering.
3. Effective in the fall of 1974, a number of scholarships have been offered to minority students through grants provided by several companies.
4. For several years, a one-week summer course has been offered for high school students. During the summer of 1974, some 600 students participated in the program at the rate of 100 a week. Special invitations were sent to minority students, encouraging them to attend the program with the fee waived.

COLLEGE OF ENGINEERING
RENSSELAER POLYTECHNIC INSTITUTE
Troy, New York

MINORITY STUDENT ENGINEERING PROGRAM

The minority student program has met with some degree of success. In 1970 there were seven minority students in the engineering program, and by 1974 the total had risen to 94.

Several important characteristics govern the minority engineering program at Rensselaer Polytechnic Institute:

Recruitment

Additional thrusts have been made beyond the normal recruiting program. Personal contacts with mathematics and science teachers and administrators in the high schools are methods for both student recruitment and evaluation. Rather than a scattered or haphazard effort, this program focuses only on those administrators and teachers who have had some previous personal contact with a faculty member at RPI. This technique has markedly improved the number and quality of new students. The secondary school personnel involved provide one of the best predictors for the potential ability of these students.

The recruiting program also involves the applicant's family. This is often a new experience for parents and students alike. It is expected that the parents will contribute some part of the cost of educating the student. Concerned, informed parents play a major part in creating an atmosphere that eases the adjustment of the student to university life.

Pre-Engineering Education

Some students need additional preparation before beginning their freshman year, although, it should be noted, the number requiring this service has decreased markedly as the modified recruiting program has expanded. To this end a preparatory program is conducted for six weeks during the summer prior to entrance by three faculty members who are usually involved in the future course of study. Each participating student is evaluated before the summer program begins and given intensified instruction in the basics of chemistry, physics, and mathematics. Classes are small to provide individual attention. Minority upperclassmen are retained as tutors on a one-to-one basis. At the conclusion of the summer program, the faculty involved evaluates the progress of the students and makes recommendations regarding the structure of the academic programs for the freshman year.

Engineering Education

Minority students usually join the regular sections for each course, but those with some academic deficiencies are assigned to special sections with a somewhat slower pace. Special sections are taught by faculty members who have participated in the summer program. In addition, tutoring sessions are provided.

All academic progress is monitored during the freshman year, and monthly reports are forwarded to a faculty committee which carefully evaluates each student's performance. If academic problems are found, a member of the faculty committee discusses these with the student and assistance is provided in an effort to resolve the problems. If problems are of a personal, social, or emotional nature, the coordinator of minority affairs in the office of the Dean of Students works with the student. The goal of this phase of the minority program is to prepare the freshmen to enter the sophomore year fully adjusted to the mainstream of university life.

Services also are provided for minority upperclassmen who are encouraged to first seek the assistance of an instructor if academic problems exist. If the faculty member determines that additional help is needed, a special tutor, usually at the graduate level, is assigned to work with the student. The procedure makes it mandatory for the student to know the instructor. Experience indicates that the student is more involved by initiating the request. In addition, this effort leads to more confidence and increased classroom attendance.

The philosophy of the minority program at RPI is rather basic. The school believes that individuals selected for admission can succeed, given structured assistance and positive counseling and guidance. The school believes it would be a tragedy to establish a four-year remedial program for Black and Puerto Rican students and upon graduation move them into the highly competitive arena of American industry. Therefore, academic crutches are eliminated as soon as the participant has indicated a readiness to proceed independently and along with other students. Some reach this plateau rapidly, others need more time and stronger supportive services, while some others are not at all successful. Generally the program has succeeded in providing a sound academic experience for Black and Puerto Rican young people who have chosen engineering as a career.

SCHOOL OF ENGINEERING
SAN JOSE STATE UNIVERSITY
San Jose, California

ENGINEERING MINORITY STUDENT PROGRAM

Although San Jose State is located in an area with a high percentage of students with Spanish surnames, the program is also concerned with meeting the educational needs of other minorities and women.

The program started in the spring of 1969 with solicitations of support from engineering-related manufacturing, business, and consulting firms in California. The financial aid which resulted has enabled the school to provide more than \$22,000 in scholarships to minority students. Scholarships are administered by the university's Financial Aids Office which determines the individual's needs.

Several companies have made available discretionary grants which are used to pay for tutorial services.

During the first two years, the teaching load of one faculty member was reduced to enable him to devote approximately one-quarter of his time as an advisor and tutor for minority students. Over the past three years, the responsibility for coordinating all minority activities and providing advice to minority students has been assigned to an administrative assistant, whose activities include:

- Providing the necessary coordination with the separate Black and Brown EOP programs on campus.
- Developing liaison with the local junior high schools, high schools, and community colleges.
- Accepting responsibility for personally advising and counseling minority students in the school.
- Maintaining the records and continuously monitoring the academic progress of all minority students.
- Supervising tutoring programs.
- Organizing and coordinating student part-time and summer employment in a trial co-op program.

With support from the General Electric Foundation, a limited number of engineering students work in local junior high and high schools on a regular basis, one-half to one day a week. Students participating in this activity usually have a financial need and must be making satisfactory progress in engineering. These persons serve as assistants to the high school counselors, act as tutors when and where needed, and serve as student aids in math and science classroom activity. The primary purpose of this program is to provide

successful role models for minority youngsters in the junior and senior high schools and ensure that they develop an awareness about engineering and science.

COLLEGE OF ENGINEERING
SOUTHERN UNIVERSITY
Baton Rouge, Louisiana

This college relies heavily on alumni, friends, high school counselors, and teachers in referring students for enrollment in engineering programs. Applicants for scholarships are solicited through mailings to all high schools in the state. All high school graduates within the state are eligible for admission to the university, and out-of-state students must be graduates from accredited high schools.

During the past several years, the college has conducted a one-day workshop on campus for high school counselors, mathematics and science teachers, and interested students. Participants are reimbursed for travel expenses. The purpose is to explain the profession and provide information about the College of Engineering and Southern University. Workshop attendees have been a valuable source for referral of students for enrollment. Summer programs for groups of 10th and 11th grade students are also held on campus for six weeks. These students engage in a series of activities, both motivational and academic in nature. In addition, many groups of junior and high school students tour the campus during the academic year, and many members of the faculty visit junior and senior high schools and participate in career day programs.

A definite need exists for personal and professional counseling once enrolled. Consequently each student is assigned an academic advisor upon matriculation. Additionally, personal counseling of students occurs frequently. This is provided by appropriate and interested faculty members and the dean of the college.

The tutoring program is carefully structured. Selected upper level enrollees, under the direction of a regular faculty member, tutor freshman and sophomore students in basic mathematics, science, and engineering.

Financial Aid

A special financial aid program is conducted in engineering by the dean and by a committee of faculty of the college. Scholarships are awarded to entering and continuing students from funds contributed by a number of private industries and foundations. An emergency loan fund is also operated by this committee.

There is close coordination between the Dean of Engineering and the Director of the regular university Financial Aid Program.

STEVENS INSTITUTE OF TECHNOLOGY
Hoboken, New Jersey

STEVENS TECHNICAL ENRICHMENT PROGRAM (STEP)

The commitment by Stevens to increase the number of women and minority engineering and science graduates is realized in part through the continuing efforts of the Stevens Technical Enrichment Program (STEP), a comprehensive support program for pre-college and undergraduate students. STEP identifies potential students, reviews their qualifications for admission, and in conjunction with Stevens' Admissions and Financial Aid Officers, grants admission and aid.

The pre-college component identifies potential students as early as the ninth grade. The major determinant is usually the student's aptitude and interest in mathematics. Once selected for participation in STEP, the pre-college enrollees enter a Saturday program during the school year and an intensive residential summer program. Both elements are designed to acquaint these individuals with career training in engineering and science.

The contrast between high school and a professional engineering school is great. Therefore, STEP has designed a program to lessen the disparity by providing both academic and effective support through the program's Retention Component. STEP provides academic support through an individualized tutorial service which parallels the actual classwork and simultaneously assists in developing the necessary skills involved in being successful students (e.g., study patterns and time budgeting). An essential aspect of the retention effort involves monitoring student programs in order to facilitate early detection and diagnosis of individual problems. Academic advisement is facilitated through the Stevens faculty, and STEP encourages its enrollees to make maximum use of advisors.

The retention strategy includes an effective development program. STEP helps students to work through any emotional stress that is rooted in the Stevens educational experience. Because many minority participants find Stevens a striking contrast to their general lifestyle, adjustment often is a problem. STEP can -- and does -- assist students in resolving such problems.

COLLEGE OF ENGINEERING
THE UNIVERSITY OF TENNESSEE
Knoxville, Tennessee

MINORITY COOPERATIVE ENGINEERING EDUCATION

This college has a motivation program for minority students aimed at overcoming the lack of positive images associated with engineering because few engineers come from the minority community.

Selection of Students

A group of minority students are selected each year from among the high school seniors who are interested in and academically qualified for engineering careers. The number of such students is determined by the level of support for this program from governmental agencies, business, and industry.

Pre-Co-op Summer Employment in Industry

Students admitted into the program are placed in industrial positions during the summer quarter immediately after their graduation from high school. This period of employment provides orientation and background knowledge about the work of the engineer through on-the-job experience. The students are placed in companies that provide continuing co-op employment after satisfactory academic performance in the freshman year.

Management of the Program

Responsibility for administering the program is assigned to the Cooperative Engineering Coordinator. Liaison with the academic departments of the College of Engineering is provided by the faculty advisors, department heads, and the Associate Dean for Academic Advising. A special Co-op Engineering Counselor is available to recruit minority students, counsel students in the Cooperative Engineering Program, and arrange tutorial assistance. Placement of students in industrial positions during the pre-co-op summer period and in the alternating quarters of full-time employment after completion of the freshman year is the responsibility of the Co-op Engineering Coordinator.

Work-Study Schedule

As part of the work-study schedule, minority students normally complete their senior year in consecutive quarters of full-time study. Two students fill a given industrial position upon completion of the freshman year.

Participation by Business, Industry, Foundations, and Government Agencies

Work Opportunities: Companies and agencies that recruit engineers and employ co-op students at the university are asked to support the program by providing the pre-co-op summer employment, making professional and managerial personnel available for orientation and career guidance, and providing engineering training assignments for co-op student employees.

Grant-in-Aid Scholarships: Students receive grant-in-aid scholarships, amounting to \$750 per quarter, during the three quarters of full-time study in the freshman year. This sum applies to tuition, fees, tutorial, remedial and other instruction, housing, food, books, and medical insurance. For the six quarters of full-time study during the sophomore and junior years, a grant-in-aid scholarship of \$300 per quarter is provided to supplement the student's savings from earnings during work periods. Grant-in-aid scholarships of \$500 per quarter are provided for the students in the three quarters of full-time study during the senior year.

COLLEGE OF ENGINEERING
UNIVERSITY OF TEXAS
Austin, Texas

EQUAL OPPORTUNITY IN ENGINEERING (EOE)

The EOE program at the University of Texas in Austin serves to recruit Black and Mexican-American students who have the demonstrated aptitude and desire to succeed in the competitive environment of the College of Engineering. Identification is aided through the overall college recruiting program, as well as Project Info, the National Merit Scholarship Corporation, the College Entrance Examination Board, the Engineers' Council for Professional Development, and the Harvard Minority Placement Program.

The program operates with the university Student Financial Aids Office to provide the maximum aid obtainable from federal, state, and university sources, and to supplement these sources as necessary with EOE and other college scholarship funds in order to meet student needs. The program has established a sliding scale of gift assistance that encourages more advanced students to provide a larger proportion of their expenses from co-op and summer job savings and from part-time employment while in school. The rationale behind this policy is to provide the freshman student with the maximum support for devoting attention to studies and adjusting to a new environment without the added burden of holding a job.

Tutorial Program

One fundamental precept of the EOE program has been a heavy emphasis on student retention. The key to meeting this objective was the establishment of a student tutorial program. In its first semester of operation, the program, available to all engineering enrollees, provided a total of 463 hours of tutoring assistance to 39 students, of whom 10 were Black or Mexican-American. In freshman mathematics courses, often considered the stumbling blocks to future success in engineering, students improved their grades by better than one letter grade on average.

Student Activities

In the spring of 1973, a group of minority engineering students, many of whom had received assistance through the EOE Program, indicated the desire to form a service organization to help further the aims of the program. Thus, Pi Sigma Pi was officially chartered with a membership of 24 Black, Mexican-American, and women engineering students. The EOE program committee agreed to underwrite the activities of this organization which contributes to the recruiting and retention of minority engineering students.

SCHOOL OF ENGINEERING
UNIVERSITY OF TEXAS
El Paso, Texas

For many years the College of Engineering at the University of Texas in El Paso has boosted a student body made up of 25 percent to 40 percent Mexican-Americans. Most of these students are from the El Paso region and, consequently, many programs have been tailored to meet their needs in mathematics, science, and engineering courses at the beginning level. Recently the university has added two essential courses -- one in English, the other in mathematics. Both of these are directed toward students with poor preparation in note-taking, examination-taking, and in quantitative problem-solving skills required in chemistry, physics, mathematics, and engineering.

Each of the student chapters of the professional societies provide tutorial assistance in freshman and sophomore classes on a regular basis. In addition, students may be assigned a faculty advisor familiar with the problems confronted by the inadequately prepared beginning student.

A main thrust in the near future will be to develop programs for encouraging Mexican-Americans to enter engineering and improving their ability to succeed in an engineering career. A combination of tutorial assistance and appropriate advising are considered the main factors necessary for the retention of Mexican-American students at a level that fosters the retention of other ethnic groups on campus.

Recruitment programs are primarily directed toward high schools and community colleges. In order to increase the possibility that students will pursue engineering as a career, efforts are made to expose them to some of the principles and concepts of the discipline early in their high school program.

SCHOOL OF ENGINEERING
TULANE UNIVERSITY
New Orleans, Louisiana

SUMMER INTERN PROGRAM FOR MINORITIES IN ENGINEERING

Tulane University is attempting to broaden the social and economic range of its educational impact. To accomplish this, it seeks to recruit and admit increased numbers of qualified but disadvantaged students.

As part of this commitment, the School of Engineering is recruiting increased numbers of qualified minority students and has designed a Summer Intern Program for students with disadvantaged backgrounds which will increase their chance of academic and occupational success. The Summer Intern Program calls for the employment of a particular student for three successive summers with the same company. This format has the effect of a "summer co-op" arrangement.

Interns are placed for their freshman, sophomore, and junior summers with a company that provides the opportunity for a student to work in an area closely related to academic interest. Tulane has strong traditional programs in chemical, civil, electrical, and mechanical engineering. It also has a special engineering curriculum in which students can design individual programs in, say, biomedical engineering, systems analysis, computer science, or environmental systems. Each intern is assigned a faculty coordinator who closely correlates the participant's academic and industrial experiences, then works with the intern during the academic year in research design or technical studies.

The company pays the student for the summer work (an estimated total of \$5,000 to \$6,000 for the three-year period), assists in obtaining housing, and fosters the social adjustment that is often required when work begins.

While Tulane recruits and evaluates prospective students from minority backgrounds, the school makes its final selections of summer interns with the assistance of the company. The university provides all the necessary scholarship aid, tutoring, and a faculty coordinator for each intern. Minority students at Tulane obtain assistance in their social development as a result of continuing university programs created specifically for this purpose.

SCHOOL OF ENGINEERING
TUSKEGEE INSTITUTE
Tuskegee Institute, Alabama

Following World War II, five predominantly Black engineering schools were established to meet the rising expectations of minority professionals and their increasing demand by business and industry. Tuskegee Institute, a private co-educational institution founded by Booker T. Washington in 1881, initiated an electrical engineering program in 1948. In 1955 a mechanical engineering curriculum was added. Through a complete reorganization of faculty and curricula in 1960 the School of Engineering embarked on a program of innovative changes.

Tuskegee has attracted sponsored research and recruited a competent faculty -- most with doctoral degrees. Visiting professorships contributed to an atmosphere of high motivation, and estimates show that about 60 percent of Tuskegee's engineering graduates subsequently earn at least a master's degree (the national average is 45 percent). Such academic vigor has stimulated enrollments, and the output has correspondingly risen from 9 baccalaureates in 1960 to 35 baccalaureates and 15 masters in 1972.

In 1967 a pre-co-op program was instituted at Tuskegee which later was successfully used at other institutions and companies. At present, 40 percent of its more than 300 engineering students follow the path of cooperative education.

In efforts to attract more Black students, Tuskegee initiated a "3/2" Dual Degree Program in 1961 with several institutions. In a characteristic bootstrap operation, Tuskegee has managed to expand the program geographically to several southeastern states and the Virgin Islands and, more significantly, has produced three graduates in spite of almost total lack of financing. While the "3/2" program cannot be viewed as providing a major artery for Black engineers, Tuskegee sees this opportunity as a useful, though limited, alternative. Similar flexibility is now applied to the junior college transfer "2/3" program.

Numerous examples of success are characteristic of the 92-year old history of Tuskegee's experience in compensatory education. Special emphasis must be given to a healthy student involvement through peer group recruiting and peer group tutoring and counseling. Recent experience has shown the value of high credibility that students bring to recruiting and the confidence and encouragement that a fellow student naturally generates in inexperienced lower division students. Thus, student tutors have enhanced academic retention.

Pre-engineering summer programs of eight-weeks duration, called PREFACE, have provided instructional and motivational benefits through intensive studies of English, pre-calculus mathematics, and introduction to engineering.

COLLEGE OF ENGINEERING
WAYNE STATE UNIVERSITY
Detroit, Michigan

MINORITY ENGINEERING PROGRAMS

Wayne State University is located in the center of Detroit and primarily serves a three county region. The city is about 50 percent black. Of some 33,000 students attending the university, nearly 20 percent are Black. The College of Engineering has nearly 1,400 students, 8 percent of whom are Black. Responding to this disparity, Wayne has instituted several programs to recruit additional minority students and provide additional services to those enrolled.

Recruitment and Financial Assistance

The college runs a regional science and engineering fair in which between 400 to 500 students from community junior and senior high schools compete each year. Although Wayne serves as host and provides some of the operational staff, the fair itself is one of six such regional activities and other people responsible for the program come from local community and industrial personnel.

In addition, the Association of Black Engineers and Applied Scientists assists the college admissions office in preparing and carrying out recruitment programs both at local high schools and on campus. These programs consist of student and faculty presentations, demonstrating general opportunities in engineering and specific programs at Wayne.

The college has established a cooperative education program which has a special industry-supported scholarship program. Through it young Blacks are offered freshman year scholarships providing essentially all expenses, to be followed by four years of a cooperative job with the local concern that provides the scholarship.

An eight-week summer experience for high school juniors, carried out cooperatively with local industry, provides potential Black engineering students with four weeks at the university and nominal summer pay for their expenses.

Special Support Programs

Each summer, 12 to 15 students whose academic records are not considered adequate for normal admission to the College of Engineering, but who have expressed enthusiasm for engineering careers, are invited to spend the summer in an intensive upgrading program taught by Wayne's staff. All students completing the program are admitted to the college. The summer program provides intensive study in mathematics, science, and learning-study skills.

The Association of Black Engineers and Applied Scientists and a number of faculty contribute their time for formal and informal tutoring activities to students who require extra academic assistance.

SCHOOL OF ENGINEERING AND PHYSICAL SCIENCES
WEST VIRGINIA INSTITUTE OF TECHNOLOGY
Montgomery, West Virginia

MINORITY ENGINEERING PROGRAM

In 1973 West Virginia Tech had a total enrollment of 523 engineering students, 72 of them from minority groups. Tech has initiated special minority recruiting and pre-admission motivational activities and provided special personal counseling, tutorial activities, and cooperative education for all students. In addition, the school provides a variety of remedial programs for those who need it.

The School of Engineering, as well as the entire institution, is making concerted efforts to increase the minority enrollment in engineering and technology programs. In 1969 Union Carbide and West Virginia Tech initiated PEP or "Pioneer Engineering Program." This program offers Black high school graduates the opportunity to earn an engineering degree through a five-year work-study course.

A minority administrator has been recruited to foster minority recruitment, develop motivational activities, and create an interest in engineering of minority high school graduates.

With 23 cooperating employers, West Virginia Tech has sponsored a program entitled "Opportunities for Blacks in Engineering." It was attended by 119 high school students, of whom 10 percent later enrolled in engineering or engineering technology. Another program, "Project COMET" (for Career Opportunities for Minorities in Engineering and Technology), has been created to:

- Acquaint high school students with the opportunities in the engineering and technology fields.
- Disclose West Virginia Tech's engineering and technology programs to these students.
- Familiarize these students with Cooperative Education.
- Exhibit the need and indicate the added emphasis for minority participation in engineering and technology.

COLLEGE OF ENGINEERING
UNIVERSITY OF WISCONSIN
Madison, Wisconsin

MINORITY ENGINEERING PROGRAM

The program at Wisconsin serves students who have completed their junior and senior years in high school and is designed to include prerequisite engineering skills and subject matter. Guidance is provided to high school juniors planning the senior year, so they may attain maximum pre-college preparation for the College of Engineering. Similar assistance is offered to the high school seniors planning their first year in the College of Engineering.

Wisconsin also features an industrial lecture series, which many company representatives provide free lectures or demonstrations on specific aspects of engineering.

Presently all the minority students in the College of Engineering are receiving financial aid. This comes principally from two sources -- the major Financial Aid Office of the university and the College of Engineering's Minority Engineering Fund. The Minority Engineering Fund is based upon contributions from industrial groups and is used to supplement the cost of a student's educational expense that is not otherwise met. For the academic year 1974-75, about \$42,000 was expended from this fund and the Financial Aid Office awarded nearly \$70,000 to minority students.

Recruitment

The College of Engineering works with Minority Engineering Education Efforts (ME³) and coordinates this activity with the College Entrance Examination Board. Further, the college has added a staff specialist to coordinate recruiting and counseling efforts.

TABLE I

COLLEGES PARTICIPATING IN PART II SURVEY

- | | |
|--|---|
| 1. University of Alabama
University, Alabama | 13. City College of New York
New York, New York |
| 2. University of Arkansas
Fayetteville, Arkansas | 14. Cleveland State University
Cleveland, Ohio |
| 3. University of Bridgeport
Bridgeport, Connecticut | 15. Cornell University
Ithaca, New York |
| 4. University of California
Berkeley, California | 16. Drexel University
Philadelphia, Pennsylvania |
| 5. California State Polytechnic
University
Pomona, California | 17. General Motors Institute
Flint, Michigan |
| 6. California Polytechnic State
University
San Luis Obispo, California | 18. Georgia Institute of Technology
Atlanta, Georgia |
| 7. California State University
Long Beach, California | 19. University of Houston
Houston, Texas |
| 8. California State University
Los Angeles, California | 20. University of Illinois (Chicago
Circle)
Chicago, Illinois |
| 9. California State University
San Jose, California | 21. Illinois Institute of Technology
Chicago, Illinois |
| 10. Carnegie-Mellon University
Pittsburgh, Pennsylvania | 22. University of Kansas
Lawrence, Kansas |
| 11. Chicago Technical College
Chicago, Illinois | 23. University of Louisville
Louisville, Kentucky |
| 12. University of Cincinnati
Cincinnati, Ohio | 24. Louisiana Technological University
Ruston, Louisiana |

TABLE I cont'd

- | | |
|---|---|
| 25. University of Maryland
College Park, Maryland | 35. Oklahoma State University
Stillwater, Oklahoma |
| 26. University of Michigan
Ann Arbor, Michigan | 36. Polytechnic Institute of New York
Brooklyn, New York |
| 27. Michigan State University
East Lansing, Michigan | 37. Pratt Institute
Brooklyn, New York |
| 28. University of Minnesota
Minneapolis, Minnesota | 38. University of Tennessee
Knoxville, Tennessee |
| 29. University of Missouri
Columbia, Missouri | 39. University of Texas at Austin
Austin, Texas |
| 30. New Jersey Institute of
Technology
Newark, New Jersey | 40. University of Texas at El Paso
El Paso, Texas |
| 31. University of New Mexico
Albuquerque, New Mexico | 41. Texas A & I University
Kingsville, Texas |
| 32. New Mexico State University
Las Cruces, New Mexico | 42. Texas A & M University
College Station, Texas |
| 33. Northeastern University
Boston, Massachusetts | 43. Tulane University
New Orleans, Louisiana |
| 34. Ohio State University
Columbus, Ohio | 44. Wayne State University
Detroit, Michigan |
| | 45. University of Wisconsin
Madison, Wisconsin |

Predominantly Plack Schools
of Engineering

- | | |
|---|--|
| 46. Howard University
Washington, D. C. | 49. Southern University
Baton Rouge, Louisiana |
| 47. North Carolina A & T University
Greensboro, North Carolina | 50. Tennessee State University
Nashville, Tennessee |
| 48. Prairie View A & M University
Prairie View, Texas | 51. Tuskegee Institute
Tuskegee Institute, Alabama |

TABLE II

TOTAL FULL-TIME ENGINEERING ENROLLMENTS - 1974*

	Total Minority	Total Enrollment	Percentage Minority
1. Prairie View A & M University	358	358	100
2. University of Texas/El Paso	324	762	43
3. City College of the City University of New York	315	1,471	21
4. Howard University	297	503	59
5. North Carolina A & T State Univ.	288	325	89
6. Southern University	278	293	91
7. Tennessee State University	275	275	100
8. New Jersey Inst. of Technology	240	2,016	12
9. Tuskegee Institute	227	254	89
10. University of Illinois/Chicago	221	1,799	12
11. New Mexico State University	205	890	23
12. California Polytechnic State/Pomona	182	1,294	14
13. University of Texas/Austin	174	2,542	7
14. University of Michigan	163	2,769	6
15. Cornell University	126	2,284	5
16. Polytechnic Inst. of New York	120	1,247	10
17. Wayne State University	119	592	20
18. Purdue University	114	4,777	2
19. California State University/ Long Beach	117	662	16
20. Texas A & I University	116	441	26
21. University of California/Berkeley	107	1,904	6
22. University of Houston	105	950	11
23. Georgia Institute of Technology	104	3,309	3
24. California State University/ Los Angeles	92	302	30
25. University of Tennessee/ Knoxville	90	1,531	6
26. Ohio State	90	2,530	4
27. University of California/ Los Angeles	90	1,020	9
28. California State University/ San Jose	89	1,126	8
29. Michigan State University	88	1,995	5
30. University of Southern California	87	727	11

TABLE II cont'd

	Total Minority	Total Enrollment	Percentage Minority
31. Carnegie-Mellon University	86	879	10
32. North Carolina State University	83	2,709	4
33. Illinois Institute of Technology	83	976	9
34. University of New Mexico	80	469	17
35. California State University/ Northridge	80	551	15
36. University of Missouri/Rolla	79	2,312	3
37. University of Wisconsin/Madison	69	2,043	3
38. Northwestern University	65	798	8
39. University of Arizona	64	1,501	4
40. Detroit Institute of Technology	58	417	14
41. University of Alabama/University	55	723	8
42. Stevens Institute of Technology	51	361	6
43. University of Pittsburgh	47	1,264	4
44. Oklahoma State University	45	1,129	4
45. University of Oklahoma	42	958	4
46. Stanford University	41	644	6
47. University of Massachusetts/ Amherst	39	1,096	4
48. University of Kansas	39	1,012	3
49. University of Bridgeport	33	1,195	2
50. Tulane University	32	448	7
51. University of Pennsylvania	32	410	8
52. Case Western Reserve University	29	269	11
53. University of the Pacific	26	183	14
54. University of Delaware	25	851	3

*Based on data reported to Engineering Manpower Commission, Engineers' Joint Council.

TABLE III

ENGINEERING SCHOOLS BY NUMBER OF FULL-TIME MINORITIES ENROLLED
AND REPORTED PROGRAMMATIC ACTIVITIES - 1973*

SCHOOL	Total Minority Enrollment 1973	Total Engineering Enrollment 1973	Special Recruiting	Special Admissions	Pre Admissions Motivational Activities	Pre Enrollment or Freshman Skills Building Orientation	Special Personal Counseling	Special Tutorial Activities	Co Op	Dual Degree
Prairie View A & M University	332	341								
North Carolina A & T State University	279	314								
Howard University	261	448								
Tuskegee Institute	243	250								
New Mexico State University	238	861								
University of Texas/EI Paso	236	782								
Tennessee State University	217	217								
City College of the City University of N. Y.	210	1394								
Southern University	200	218								
University of Illinois at Chicago Circle	198	1837								
New Jersey Institute of Technology (Newark College of Engineering)	194	2131								
Texas A & M University	188	2988								
California Poly. State Univ./San Luis Obispo	166	1528								
General Motors Institute	156	2141								
Texas A & I University	148	480								
University of Michigan/Ann Arbor	140	2730								
Wayne State University	126	941								
University of California/Berkeley	113	1545								
Cornell University	112	2255								
California State Poly. Univ./Pomona	99	1350								
University of Houston	99	860								
California State University/Los Angeles	99	347								
California State University/Long Beach	97	1053								
Pratt Institute	94	489								
University of Miami	92	386								
Purdue University	91	4681								
University of Texas/Austin	89	2365								
University of California/Los Angeles	83	857								
Michigan State University	83	1715								
Illinois Institute of Technology	80	872								
California State University/San Jose	79	1156								
Massachusetts Institute of Technology	73	1269								
Ohio State University	73	2334								
Stevens Institute of Technology	68	870								

TABLE III cont'd.

SCHOOL	Total Minority Enrollment 1973*	Total Engineering Enrollment 1973*	Special Recruiting	Special Admissions	Pre Admissions Motivational Activities	Pre-Enrollment or Freshman Skills Building/Orientation	Special Personal Counseling	Special Tutorial Activities	Co-Op	Dual Degree
Polytechnic Institute of New York	64	1151								
University of New Mexico	64	753								
Northeastern University	62	757								
Georgia Institute of Technology	60	3107								
University of Texas/Arlington	60	1309								
University of Illinois/Urbana-Champaign	58	3431								
University of Arizona	57	1278								
Drexel University	56	1547								
University of South Florida	56	1017								
Ramapo Polytechnic Institute	55	1097								
University of Detroit	49	884								
Oklahoma State University	49	991								
North Carolina State University	47	2457								
University of Alabama/University	44	629								
University of Notre Dame	43	780								
Columbia University	42	806								
Worcester Polytechnic Institute	42	1262								
University of Colorado	39	1683								
University of Wisconsin/Madison	39	1826								
Lamar University	37	549								
Northeastern University	37	2149								
Louisiana Tech University	37	475								
California State University/San Diego	36	689								
Pennsylvania State University	36	3432								
University of Tennessee/Knoxville	36	1350								
University of Maryland	35	1521								
Texas Tech University	35	976								
Oakland University	35	345								
Carnegie-Mellon University	34	813								
University of Kansas	33	895								
Tufts University	33	642								
Princeton University	32	571								
Washington University	32	519								
Louisiana State University/Baton Rouge	32	1292								

TABLE III cont'd.

SCHOOL	Total Minority Enrollment 1973*	Total Engineering Enrollment 1973*	Special Recruiting	Special Admissions	Pre-Admissions Motivational Activities	Pre-Enrollment or Freshman Skills Building Orientation	Special Personal Counseling	Special Tutorial Activities	Co-Op	Dual Degree
Northrop Institute of Technology	31	390								
Mississippi State University	30	1009								
University of Washington	30	1644								
California State University/San Francisco	29	200								
University of Pennsylvania	28	372								
University of Missouri/Columbia	28	1062								
Tulane University	28	418								
University of California/Irvine	28	245								
Arizona State University	28	852								
University of Kentucky	28	946								
U.S. Naval Academy	28	904								
University of Minnesota	27	2063								
Michigan Technological University	26	1945								
New Mexico Institute of Mining & Tech.	26	120								
Marquette University	26	617								
University of Massachusetts	25	932								
Bradley University	25	349								
Loyola Marymount University/Los Angeles	25	183								
University of Wisconsin/Milwaukee	25	649								
Auburn University	23	1378								
Boston University	23	155								
University of Florida	23	813								
Lowell Technological Institute	23	1439								
University of Pittsburgh	21	1140								
Vanderbilt University	21	761								
University of Alabama/Birmingham	20	166								
Brown University	20	346								
West Virginia University	20	878								
University of Arkansas	20	740								
Old Dominion University	19	249								
Iowa State University	19	2539								
University of S.W. Louisiana	19	515								
Manhattan College	19	756								
California State University/Fresno	18	386								

TABLE III cont'd.

SCHOOL	Total Minority Enrollment 1972*	Total Engineering Enrollment 1972*	Special Recruiting	Special Admissions	Pre Admissions Motivational Activities	Pre Enrollment or Freshman Skills Building Orientation	Special Personal Counseling	Special Tutorial Activities	Co-Op	Dual Degree
University of New Haven	18	297								
Cleveland State University	18	790								
University of South Carolina	18	602								
Fairleigh Dickinson University	17	318								
Rutgers University	17	888								
University of Bridgeport	16	251								
Colorado School of Mines	16	1308								
University of Denver	16	217								
University of Santa Clara	16	247								
University of Connecticut	15	879								
University of Dayton	15	434								
Trinity University	15	83								
Virginia Polytechnic Institute	15	2228								
University of Cincinnati	14	1856								
Case Western Reserve University	14	1285								
Christian Brothers College	14	182								
Lafayette College	14	371								
University of the Pacific	14	141								
Rochester Institute of Technology	14	830								
University of Virginia	14	853								
University of Wisconsin Platteville	14	449								
Kansas State University	14	930								
University of Rhode Island	12	586								
Oregon State University	12	1704								
Stanford University	12	478								
Youngstown State University	12	614								
Southern Methodist University	12	329								
Syracuse University	12	463								
Tennessee Technological University	12	939								
Clemson University	11	952								
Washington State University	11	1130								
University of California Santa Barbara	10	332								
University of Oklahoma	10	891								
University of Rochester	10	306								

TABLE III cont'd.

SCHOOL	Total Minority Enrollment 1973*	Total Engineering Enrollment 1973*	Special Recruiting	Special Admissions	Pre-Admission Instructional Activities	Pre-Enrollment or Freshman Skills Building Orientation	Special Personal Counseling	Special Tutorial Activities	Co-Op	Dual Degree
Lehigh University	10	1487								
University of California/Davis	10	990								
California State University/Chico	9	312								
University of Delaware	9	708								
State Univ. of New York/Stony Brook	9	306								
Swarthmore College	9	88								
U.S. Air Force Academy	9	500								
The Citadel	8	248								
Colorado State University	8	758								
Florida Institute of Technology	8	298								
Florida Technological University	8	488								
Rose-Hulman Institute of Technology	8	700								
Rice University	8	24								
Tri-State College	8	994								
The Cooper Union	7	328								
Dartmouth College	7	151								
University of Louisville	7	514								
Montana State University	7	831								
State University of New York Maritime Coll.	7	271								
University of Utah	7	1016								
Southern Illinois University	7	288								
University of Missouri/Rolla	7	2388								
University of Nebraska/Lincoln	7	1383								
Villanova University	7	625								
Brigham Young University	6	804								
Catholic University of America	6	187								
Memphis State University	6	271								
University of Nevada/Reno	6	266								
South Dakota School of Mines and Tech.	6	846								
University of Toledo	6	619								
State University of New York/Buffalo	6	954								
University of Tulsa	6	424								
Virginia Military Institute	6	357								
Bucknell University	5	380								

TABLE III cont'd.

SCHOOL	Total Minority Enrollment 1973*	Total Engineering Enrollment 1973*	Special Recruiting	Special Admissions	Pre Admissions Information Activities	Pre-Enrollment or Freshman Skills Building Orientation	Special Personal Counseling	Special Tutorial Activities	Co-Op	Dual Degree
University of Hartford	5	152								
University of Vermont	5	411								
Villanova University	5	343								
Wichita State University	5	718								
University of Wyoming	5	610								
University of Akron	4	917								
Clarkson College of Technology	4	1370								
Duke University	4	481								
University of Iowa	4	410								
Ohio University	4	485								
Harvey Mudd College	4	45								
Union College	4	738								
Walla Walla College	4	87								
Air Force Institute of Technology	3	58								
California State University/Sacramento	3	478								
University of Evansville	3	211								
Gannon College	3	158								
Johns Hopkins University	3	122								
University of Idaho	3	488								
University of Mississippi	3	249								
Utah State University	3	252								
California Institute of Technology	2	215								
Hofstra University	2	121								
Monmouth College	2	48								
St. Martin's College	2	40								
Seattle University	2	82								
Western New England College	2	178								
University of Maine	2	670								
Norwich University	1	132								
South Dakota State University	1	529								
SUNY College of Ceramics/Alfred	1	247								
University of Alaska	1	142								
University of Georgia	1	70								
West Virginia Institute of Technology	1	485								

*Based on data reported to Engineering Manpower Commission, Engineering's Joint Council.

TABLE IV

ENGINEERING SCHOOLS AND THE NUMBER OF BLACK STUDENTS ENROLLED - 1973*

School	Blacks Enrolled	School	Blacks Enrolled
1. Prairie View A & M Univ.	332	36. Tufts University	33
2. North Carolina A & T State U.	279	37. Calif. State U./Long Beach	33
3. Howard University	261	38. University of Kansas	33
4. Tuskegee Institute	242	39. Louisiana Tech. Univ.	31
5. Tennessee State University	217	40. Worcester Polytechnic Univ.	30
6. Southern University	200	41. University of Maryland	30
7. City College of the CUNY	165	42. Pennsylvania State University	30
8. New Jersey Inst. of Tech. (Newark Coll. of Engineering)	149	43. Calif. State U./San Jose	29
9. General Motors Institute	136	44. Oklahoma State University	29
10. U. of Illinois/Chicago	133	45. Mississippi State Univ.	29
11. University of Michigan	129	46. Univ. of Missouri/Columbia	29
12. Wayne State University	104	47. Calif. Poly St. U/Pomona	29
13. Cornell University	96	48. Washington University	28
14. Michigan State University	82	49. U. of Wisconsin/Madison	28
15. Purdue University	79	50. Stevens Inst. of Technology	28
16. Pratt Institute	65	51. Texas A & M University	27
17. Ohio State University	65	52. University of Pennsylvania	27
18. Univ. of Illinois/Urbana	58	53. Tulane University	26
19. Massachusetts Inst. of Tech.	56	54. Lamar University	26
20. Georgia Institute of Tech.	54	55. Univ. of Texas/Arlington	25
21. Northwestern University	54	56. University of Notre Dame	25
22. Drexel University	51	57. Columbia University	24
23. Calif. Poly. St. U/San Luis Obispo	51	58. Bradley University	23
24. Rensselaer Polytechnic Inst.	48	59. University of South Florida	23
25. Illinois Inst. of Tech.	46	60. University of Texas/Austin	23
26. Polytechnic Inst. of New York	42	61. Marquette University	21
27. Univ. of Detroit	42	62. University of Pittsburgh	21
28. Calif. State U./Los Angeles	42	63. Brown University	20
29. University of Houston	40	64. U.S. Naval Academy	20
30. Univ. of Alabama/University	38	65. West Virginia University	20
31. North Carolina State Univ.	38	66. Lowell Technical Institute	19
32. Univ. of Calif./Berkeley	37	67. Princeton University	18
33. Univ. of Tennessee/Knoxville	35	68. Texas Tech. University	18
34. Carnegie Mellon University	34	69. Vanderbilt University	18
35. Oakland University	33	70. Northeastern University	17
		71. University of Washington	17
		72. Univ. of Massachusetts	17

TABLE IV cont'd.
SchoolBlacks
Enrolled

School

Blacks
Enrolled

73. U. of Alabama/Birmingham	16	121. Widener College	6
74. Northrop Inst. of Tech.	16	122. Boston University	6
75. University of South Carolina	16	123. Syracuse University	6
76. University of Bridgeport	15	124. New Mexico State Univ.	6
77. University of Arkansas	15	125. Catholic Univ. of America	6
78. Virginia Poly. Institute	15	126. University of Florida	6
79. Christian Brothers University	14	127. Memphis State University	6
80. University of Dayton	14	128. U.S. Air Force Academy	6
81. University of Kentucky	14	129. University of Toledo	6
82. Auburn University	14	130. University of Texas/El Paso	5
83. University of Minnesota	14	131. Loyola Marymount University	5
84. Old Dominion University	13	132. Fairleigh Dickinson Univ.	5
85. Univ. of SW Louisiana	13	133. Dartmouth College	5
86. University of Colorado	13	134. Florida Inst. of Technology	5
87. University of Virginia	13	135. The Cooper Union	5
88. University of Cincinnati	13	136. Florida Technological Univ.	5
89. Univ. of Wisconsin/Milwaukee	13	137. University of Tulsa	5
90. Cleveland State Univ.	13	138. Univ. of Missouri/Rolla	5
91. Tennessee Tech. University	12	139. SUNY/Stony Brook	5
92. Iowa State University	12	140. Valparaiso University	5
93. University of New Haven	12	141. Wichita State University	5
94. Calif. St. U/San Francisco	12	142. Bucknell University	5
95. Lafayette College	11	143. Villanova University	5
96. Louisiana State U/Baton Rouge	11	144. Univ. of Iowa	4
97. Youngstown State University	10	145. University of the Pacific	4
98. U. of Wisconsin/Platteville	10	146. Arizona State University	4
99. University of Miami	10	147. Southern Methodist University	4
100. U. of Southern California	9	148. Washington State University	4
101. U. of California/Irvine	9	149. Stanford University	4
102. Kansas State University	9	150. Rochester Inst. of Tech.	4
103. University of Delaware	9	151. Duke University	4
104. Case Western Reserve Univ.	9	152. University of Akron	4
105. Michigan Tech. Univ.	8	153. University of Rhode Island	3
106. Lehigh University	8	154. SUNY/Buffalo	3
107. University of Arizona	8	155. Colorado State University	3
108. Manhattan College	8	156. University of Nebraska	3
109. Swarthmore College	8	157. Air Force Inst. of Tech.	3
110. The Citadel	8	158. U. of Calif./Santa Barbara	3
111. Clemson University	8	159. SUNY Maritime College	3
112. Rose Hulman Inst. of Tech.	8	160. Gannon College	3
113. University of Rochester	7	161. Virginia Military Institute	3
114. Rutgers University	7	162. University of Evansville	3
115. University of Connecticut	7	163. University of Mississippi	3
116. University of Louisville	7	164. University of Oklahoma	3
117. Oregon State University	7	165. University of Calif./Davis	3
118. University of New Mexico	6	166. University of Vermont	3
119. Southern Illinois University	6	167. South Dakota School of Mines	2
120. University of Denver	6	168. Harvey Mudd University	2

TABLE IV cont d. School	Blacks Enrolled	School	Blacks Enrolled
169. Calif. Inst. of Tech.	2	181. St. Martin's College	1
170. Colorado School of Mines	2	182. University of Wyoming	1
171. New Mexico Inst. of Mining & Tech.	2	183. West Virginia School of Tech.	1
172. Texas A & I University	2	184. John Hopkins University	1
173. Monmouth College	2	185. Seattle University	1
174. University of Hartford	2	186. Union College	1
175. California State Univ/Chico	2	187. Western New England College	1
176. Hofstra University	2	188. Brigham Young University	1
177. Utah State University	2	189. University of Idaho	1
178. University of Alaska	1	190. University of Utah	1
179. Rice University	1	191. University of Santa Clara	1
180. Trinity University	1		

*Based on data reported to Engineering Manpower Commission, Engineers' Joint Council.

TABLE V

ENGINEERING SCHOOLS AND THE NUMBER OF SPANISH-SURNAMED STUDENTS ENROLLED - 1973*

School	Spanish Surnamed Enrolled	School	Spanish Surnamed Enrolled
1. University of Texas/El Paso	231	33. Arizona State University	19
2. New Mexico State University	212	34. Univ. of Calif./Irvine	18
3. Texas A & I University	146	35. Michigan Technological Univ.	18
4. Texas A & M University	99	36. Columbia University	18
5. University of Miami	81	37. Calif. State U/Fresno	18
6. Calif. Poly St. U/San Luis Obispo	75	38. Calif. State U/San Francisco	17
7. University of Calif./Berkeley	68	39. Boston University	17
8. University of Texas/Austin	65	40. Massachusetts Inst. of Tech.	17
9. Calif. State Poly/Pomona	65	41. Texas Tech University	17
10. Univ. of Illinois/Chicago	62	42. University of Florida	17
11. Calif. State Univ./Long Beach	58	43. Cornell University	16
12. Calif. State Univ./Los Angeles	54	44. University of Notre Dame	16
13. University of New Mexico	52	45. Univ. of Santa Clara	15
14. City College of CUNY	45	46. Tririty University	14
15. University of Houston	45	47. Northrop Inst. of Technology	14
16. New Jersey Inst. of Technology (Newark Coll. of Engineering)	45	48. Princeton University	14
17. Calif. State U./San Jose	43	49. Colorado School of Mines	13
18. Univ. of California/Los Angeles	42	50. Worcester Poly. Inst.	12
19. University of Arizona	41	51. General Motors Institute	11
20. Stevens Inst. of Technology	40	52. Lamar University	11
21. Calif. State U./San Diego	36	53. Manhattan College	11
22. Illinois Inst. of Technology	34	54. University of the Pacific	10
23. University of South Florida	32	55. University of Denver	10
24. University of Texas/Arlington	31	56. University of Minnesota	10
25. New Mexico Inst. of Mining & Technology	24	57. Purdue University	10
26. Pratt Institute	24	58. Rutgers University	10
27. Wayne State University	22	59. University of Rhode Island	9
28. Polytechnic Inst. of New York	22	60. Auburn University	9
29. University of Colorado	22	61. Northwestern University	8
30. Louisiana State U/Baton Rouge	21	62. U.S. Naval Academy	8
31. Northeastern University	20	63. University of Michigan	8
32. Loyola Marymount/Los Angeles	20	64. Univ. of Massachusetts	8
		65. Fairleigh Dickinson Univ.	8
		66. Stanford University	8
		67. Univ. of Wisconsin/Madison	8

TABLE V cont'd.

School	Spanish Surnamed Enrolled	School	Spanish Surnamed Enrolled
68. University of Washington	8	112. Vanderbilt University	3
69. University of Connecticut	8	113. U.S. Air Force Academy	3
70. University of Detroit	7	114. Florida Tech. University	3
71. Univ. of Wisconsin/Milwaukee	7	115. Union College	3
72. Rice University	7	116. University of Oklahoma	3
73. Southern Methodist University	7	117. Calif. State Univ/Sacramento	3
74. Rensselaer Polytechnic Inst.	7	118. Washington State University	3
75. U. of Calif./Santa Barbara	7	119. Louisiana Tech. University	2
76. Calif. State Univ/Chico	7	120. Dartmouth College	2
77. Univ. of California/Davis	7	121. Harvey Mudd College	2
78. University of Alabama/Univ.	6	122. Marquette University	2
79. University of New Haven	6	123. University of Hartford	2
80. Oklahoma State University	6	124. U. of Wisconsin/Platteville	2
81. North Carolina State Univ.	6	125. Univ. of South Carolina	2
82. Georgia Institute of Tech.	6	126. U. of Missouri/Rolla	2
83. The Penn State University	6	127. SUNY/Buffalo	2
84. Univ. of Southwest Louisiana	5	128. Youngstown State University	2
85. University of Maryland	5	129. Lehigh University	2
86. Cleveland State University	5	130. Univ. of Pennsylvania	2
87. Old Dominion University	5	131. University of Vermont	2
88. Colorado State University	5	132. Florida Inst. of Technology	2
89. Iowa State University	5	133. University of Arkansas	2
90. Oregon State University	5	134. The Cooper Union	2
91. Tri State College	5	135. Villanova University	2
92. Kansas State University	5	136. University of Idaho	2
93. Univ. of Alabama/Birmingham	4	137. University of Utah	2
94. University of Nebraska	4	138. Bradley University	2
95. Clarkson College of Technology	4	139. Oakland University	2
96. University of Nevada	4	140. University of Maine	2
97. SUNY/Stony Brook	4	141. Swarthmore College	1
98. Syracuse University	4	142. St. Martin's College	1
99. Ohio State University	4	143. University of Dayton	1
100. University of Wyoming	4	144. Mississippi State University	1
101. Washington University	4	145. Tuskegee Institute	1
102. Walla Walla College	4	146. University of Southern Calif.	1
103. State Univ. of NY Maritime	4	147. University of Georgia	1
104. Lowell Tech. Institute	4	148. Southern Illinois University	1
105. Case Western Reserve Univ.	4	149. Seattle University	1
106. Montana State University	4	150. Virginia Military Institute	1
107. Brigham Young University	4	151. University of Tulsa	1
108. Lafayette College	3	152. Clemson University	1
109. Drexel University	3	153. Western New England College	1
110. University of Rochester	3	154. University of Cincinnati	1
111. University of Kentucky	3	155. Utah State University	1

TABLE V cont'd.

School	Spanish Surnamed Enrolled
156. Norwich University	1
157. South Dakota School of Mines	1
158. South Dakota State University	1

*Based on data reported to Engineering Manpower Commission, Engineers' Joint Council.

TABLE VI

ENGINEERING SCHOOLS AND THE NUMBER OF INDIAN STUDENTS ENROLLED - 1973*

School	Indians Enrolled	School	Indians Enrolled
1. Texas A & M Univ.	63	34. U. of Michigan/Ann Arbor	3
2. Calif. St. U/San Luis Obispo	40	35. U. of Minnesota	3
3. New Mexico State University	21	36. U. of Nevada/Reno	2
4. Oklahoma State University	14	37. Syracuse University	2
5. University of Houston	14	38. University of Notre Dame	2
6. University of Kentucky	11	39. Drexel University	2
7. General Motors Institute	9	40. U. of Wisconsin/Platteville	2
8. Univ. of Calif./Berkeley	8	41. John Hopkins University	2
9. Univ. of Arizona	8	42. Rochester Inst. of Technology	2
10. Calif. State U/San Jose	7	43. Purdue University	2
11. Calif. State U/Long Beach	6	44. Virginia Military Institute	2
12. University of New Mexico	6	45. Clemson University	2
13. Calif. State Poly/Pomona	6	46. Iowa State University	2
14. U. of Wisconsin/Milwaukee	5	47. University of SW Louisiana	1
15. Pratt Institute	5	48. U. of North Carolina/Charlotte	1
16. University of Washington	5	49. University of Portland	1
17. Arizona State University	5	50. Old Dominion University	1
18. Ohio State University	4	51. University of Miami	1
19. Louisiana Tech. University	4	52. Univ. of California/Irvine	1
20. Fairleigh Dickinson Univ.	4	53. Northrop Inst. of Technology	1
21. Univ. of Texas/Arlington	4	54. University of South Florida	1
22. University of Colorado	4	55. Michigan State University	1
23. University of Oklahoma	4	56. Univ. of Texas/Austin	1
24. University of Utah	4	57. State U. of New York/Buffalo	1
25. Calif. State U/Los Angeles	3	58. Southern Methodist Univ.	1
26. Tri-State College	3	59. University of Hartford	1
27. Univ. of Illinois/Chicago	3	60. Florida Inst. of Technology	1
28. Marquette University	3	61. U. of Tennessee/Knoxville	1
29. University of Arkansas	3	62. University of Virginia	1
30. Univ. of Wisconsin/Madison	3	63. Colorado School of Mines	1
31. North Carolina State Univ.	3	64. Case Western Reserve Univ.	1
32. Montana State University	3	65. Brigham Young University	1
33. South Dakota School of Mines	3	66. New York College of Ceramics/ Alfred	1

* Based on data reported to Engineering Manpower Commission, Engineers' Joint Council.

TABLE VII

PERSONS OF MINORITY ORIGIN FOR REGIONS AND STATES: 1970

Regions and States	Total ¹ Population	Persons of Minority Origin			
		Black ²	Chicano ³ Mexican- American	Puerto ⁴ Rican	American ⁵ Indian
NEW ENGLAND					
Maine	992,048	2,816			
New Hampshire	737,681	2,667	571		
Vermont	444,330	684			
Massachusetts	5,689,170	173,697	3,466	23,332	
Rhode Island	946,725	25,219	602	981	
Connecticut	3,031,709	181,474	1,830	37,609	
MIDDLE ATLANTIC					
New York	18,236,967	2,164,560	21,950	916,825	28,355
New Jersey	7,168,164	769,245	6,343	138,896	
Pennsylvania	11,793,909	1,016,551	9,610	44,263	
EAST NORTH CENTRAL					
Ohio	10,652,017	970,130	26,795	20,272	
Indiana	5,193,669	356,379	30,034	9,269	
Illinois	11,113,976	1,422,353	160,477	87,509	
Michigan	8,875,083	990,663	65,329	6,202	
Wisconsin	4,417,731	128,128	18,269	7,248	
WEST NORTH CENTRAL					
Minnesota	3,804,971	34,721	10,597		23,128
Iowa	2,824,376	32,542	7,497		
Missouri	4,676,501	479,746	13,924	1,801	
North Dakota	617,761	2,519	627		
South Dakota	665,507	1,844	951		32,365
Nebraska	1,483,493	40,064	11,838		
Kansas	2,246,578	106,324	28,927	683	
SOUTH ATLANTIC					
Delaware	548,104	78,305	616	2,486	
Maryland	3,922,399	692,494	5,543	6,262	
District of Columbia	756,510	537,570	1,534	1,046	
Virginia	4,648,494	860,302	5,953	4,098	
West Virginia	1,744,237	66,804	1,051		
North Carolina	5,082,059	1,125,885	5,093	2,482	44,406
South Carolina	2,590,516	788,455	1,804	2,096	
Georgia	4,589,575	1,184,062	5,850	3,615	
Florida	6,789,443	1,041,966	20,869	28,166	

TABLE VII cont'd.

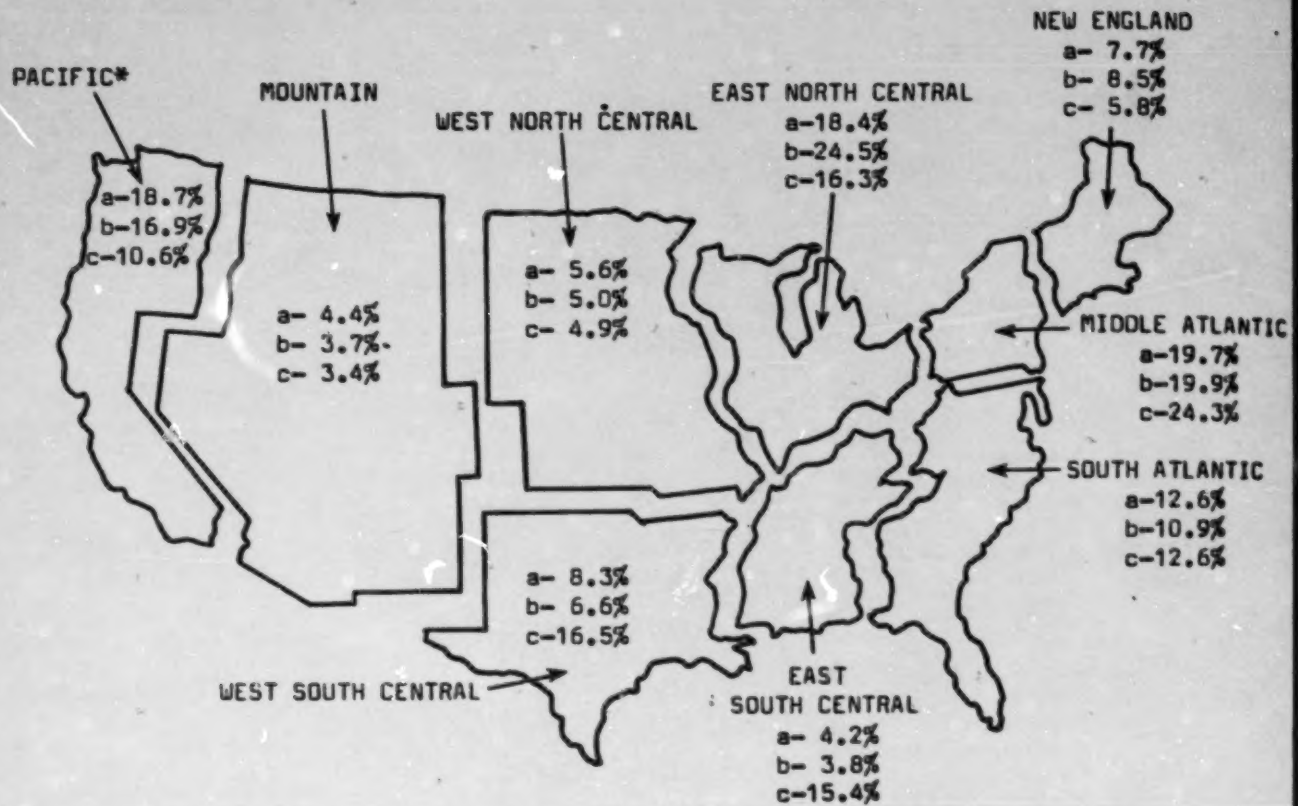
PERSONS OF MINORITY ORIGIN FOR REGIONS AND STATES: 1970

Regions and States	Total Population	Persons of Minority Origin			
		Black	Chicano Mexican- American	Puerto Rican	American Indian
EAST SOUTH CENTRAL					
Kentucky	3,218,706	230,363	2,942	860	
Tennessee	3,923,687	620,636	2,301	1,227	
Alabama	3,444,165	903,000	1,401	1,028	
Mississippi	2,216,912	815,626	966		
WEST SOUTH CENTRAL					
Arkansas	1,923,295	352,539	2,281		
Louisiana	3,641,306	1,085,227	7,300	2,430	
Oklahoma	2,559,229	171,216	14,441	1,124	98,468
Texas	11,196,730	1,396,605	1,619,252	6,334	
MOUNTAIN					
Montana	694,409	1,800	3,736		
Idaho	712,567	2,037	10,478		
Wyoming	332,416	2,455	6,628		
Colorado	2,207,259	66,066	103,584	1,707	
New Mexico	1,016,000	19,314	119,049		72,788
Arizona	1,770,900	52,799	240,025	1,047	95,812
Utah	1,059,273	6,324	14,560	739	
Nevada	488,738	27,621	9,486	674	
PACIFIC					
Washington	3,409,169	70,859	33,483	1,845	33,386
Oregon	2,091,385	26,211	11,266	522	
California	19,953,134	1,398,498	1,856,841	50,917	91,018
Alaska	300,382	8,860	1,899	534	
Hawaii	768,561	7,590	2,299	9,300	

1. Source: 1970 Census of Population, U.S. Dept. of Commerce, Social and Economic Statistics Administration.
2. Source: 1970 Census of Population, U.S. Dept. of Commerce, Social and Economic Statistics Administration, Negro Population, Subject Report.
3. Source: Census of Population: 1970, Persons of Spanish Ancestry, Supplementary Report, PC (S1)-30, February, 1973.
Note: Only states with sizeable concentrations of Chicano/Mexican Americans are reported.
4. Source: Census of Population: 1970, Persons of Spanish Ancestry, Supplementary Report, PC (S1)-30, February, 1973.
Note: Only states with sizeable concentrations of Puerto Ricans are reported.
5. Source: Census of Population, 1970, U.S. Department of Commerce, Social and Economic Statistics Administration.
Note: Only states with sizeable concentrations of American Indians are reported.

TABLE VIII

GEOGRAPHICAL LOCATION OF THE ENGINEERING POPULATION, 1972



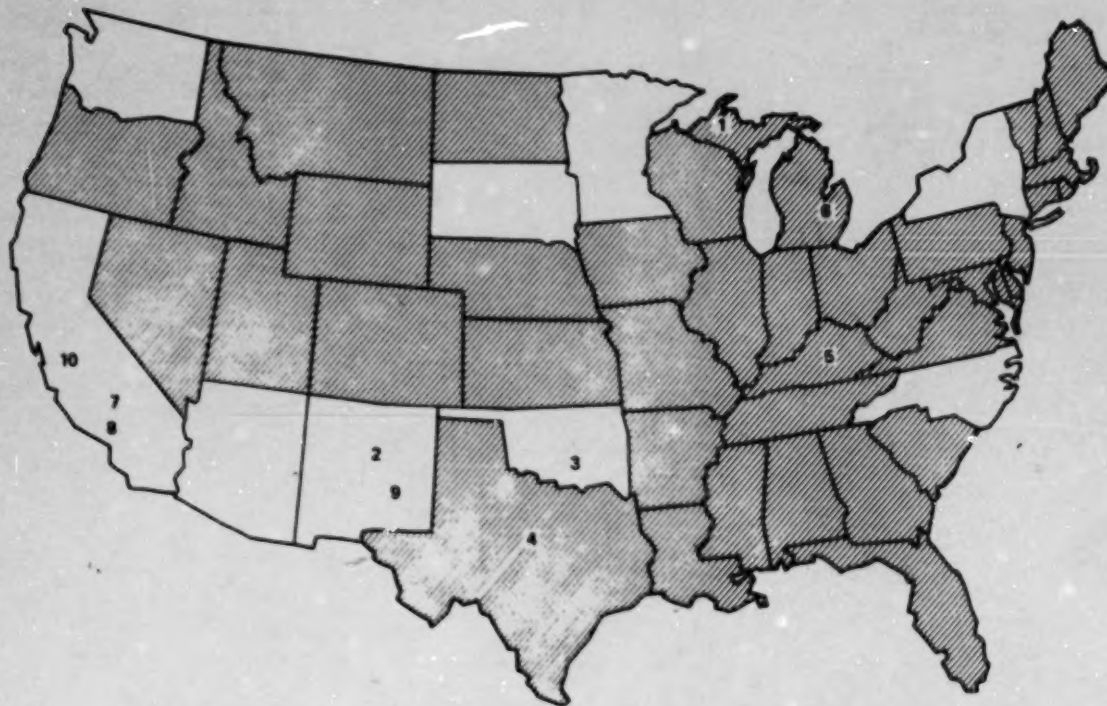
a-Total Engineers
 b-Mechanical Engineers
 c-Chemical Engineers

*Includes Alaska & Hawaii.

Source: 1972 Postconsal
 Survey, National Science
 Foundation, January 1975

FIGURE I

PREDOMINANTLY WHITE ENGINEERING SCHOOLS WITH LARGEST BLACK ENROLLMENT



Engineering schools enrolling largest number of American Indians, in order.

1. Mich Tech
2. New Mexico State
3. Okla State
4. Univ of Houston
5. Univ of Ky
6. Gen Motors Inst
7. Cal State, San Jose
8. Cal State, Long Beach
9. Univ of New Mexico
10. Cal State Poly, Pomona

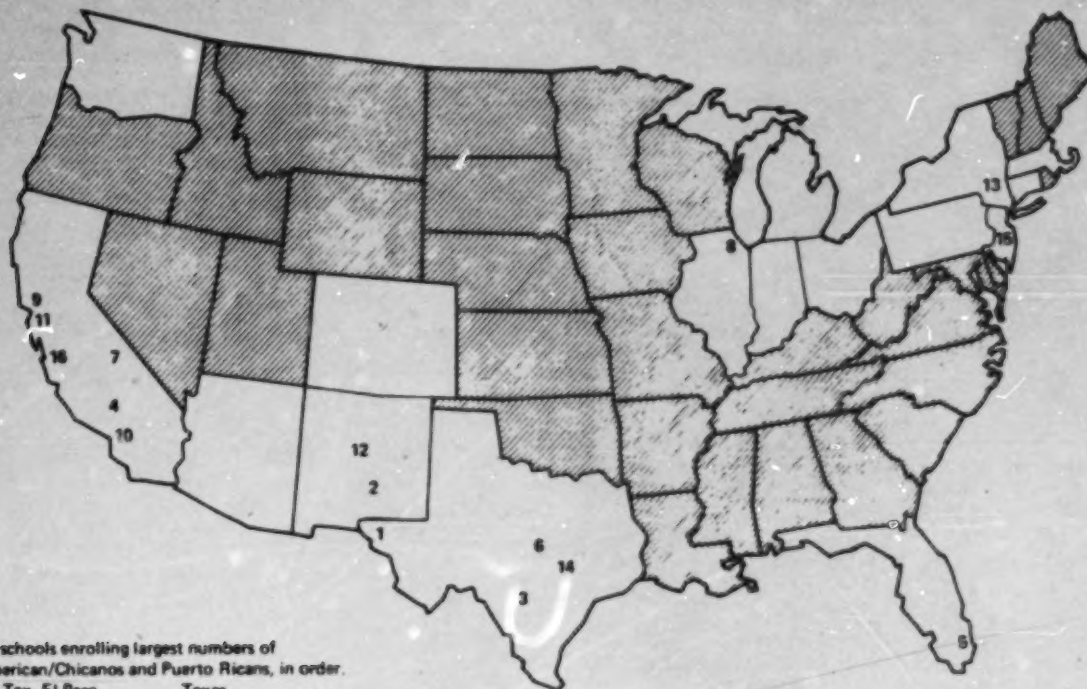
Location (approx.) of predominantly white engineering schools in order of largest American Indian enrollment.*

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Unshaded areas show states with the largest American Indian population.

*Source: Engineering and Technology Enrollments, Fall, 1973, Engineering Manpower Commission (EMC) of the Engineers' Joint Council, New York.

ENGINEERING SCHOOLS WITH LARGEST MEXICAN-AMERICAN/CHICANO AND PUERTO RICAN ENROLLMENT -1973



Engineering schools enrolling largest numbers of Mexican-American/Chicanos and Puerto Ricans, in order.

- | | |
|--|------------|
| 1. Univ of Tex, El Paso | Texas |
| 2. New Mex State | New Mexico |
| 3. Texas A & I | Texas |
| 4. Cal State, Los Angeles | Calif |
| 5. Univ of Miami | Florida |
| 6. Univ of Tex, Austin | Texas |
| 7. Cal State Poly, Pomona | Calif |
| 8. Univ of Ill, Chicago | Illinois |
| 9. Cal Poly, San Luis Obispo | California |
| 10. Cal State, Long Beach | California |
| 11. Univ of Cal, Berkeley | California |
| 12. Univ of New Mexico | New Mexico |
| 13. City College of CUNY | New York |
| 14. Univ of Houston | Texas |
| 15. New Jersey Inst of Tech
(Newark College of Eng) | New Jersey |
| 16. Cal State, San Jose | California |

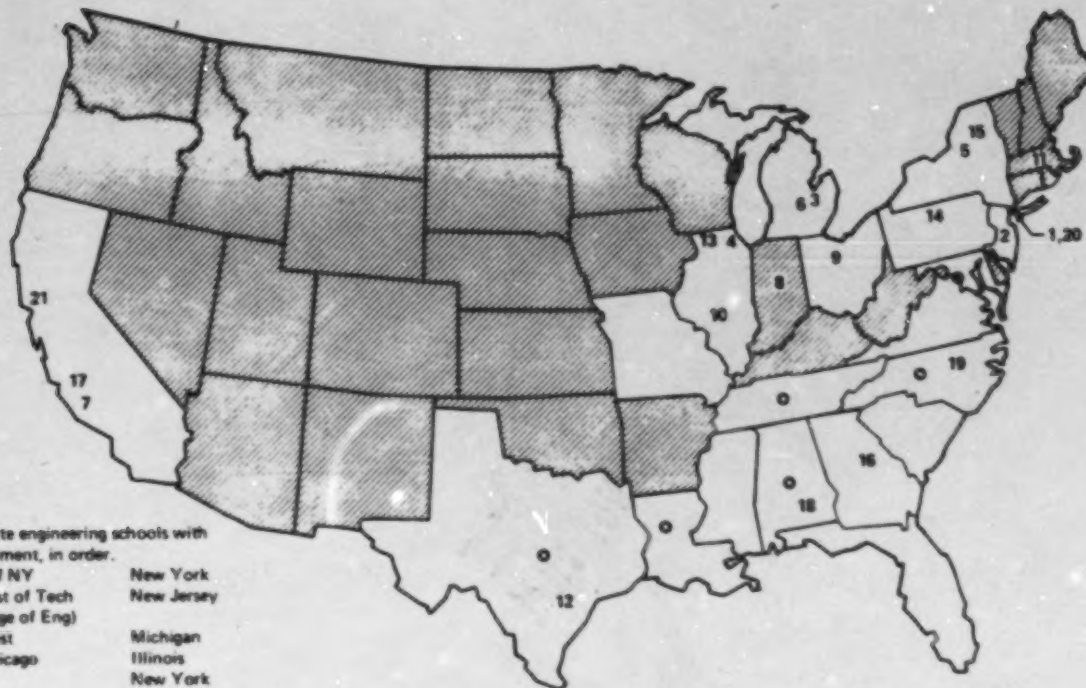
Location (approx.) of predominantly white engineering schools in order of Mexican-American/Chicano and Puerto Rican enrollment.^a

Unshaded areas show states with the largest Mexican-American/Chicano and Puerto Rican population.

*Source: Engineering and Technology Enrollments, Fall, 1973, Engineering Manpower Commission (EMC) of the Engineers' Joint Council, New York.

FIGURE III

ENGINEERING SCHOOLS WITH LARGEST AMERICAN INDIAN ENROLLMENT - 1973



Predominantly white engineering schools with largest Black enrollment, in order.

- | | |
|--|---------------|
| 1. City College of NY | New York |
| 2. New Jersey Inst of Tech (Newark College of Eng) | New Jersey |
| 3. Gen Motors Inst | Michigan |
| 4. Univ of Ill, Chicago | Illinois |
| 5. Cornell | New York |
| 6. Mich State | Michigan |
| 7. Cal State, Los Angeles | California |
| 8. Purdue | Indiana |
| 9. Ohio State | Ohio |
| 10. Univ of Ill, Urbana | Illinois |
| 11. MIT | Massachusetts |
| 12. Univ of Houston | Texas |
| 13. Northwestern | Illinois |
| 14. Drexel | Pennsylvania |
| 15. RPI | New York |
| 16. Ga Inst of Tech | Georgia |
| 17. Cal Poly, San Luis Obispo | California |
| 18. Univ of Ala | Alabama |
| 19. North Carolina State | No. Carolina |
| 20. Pratt | New York |
| 21. Univ of Cal, Berkeley | California |

○ Location (approx.) of engineering schools, traditionally Black enrollment.

1 Location (approx.) of predominantly white engineering schools in order of largest Black enrollment.

Engineering Schools, Traditionally Black Enrollment

- Tennessee State University, Nashville, Tenn.
- North Carolina Agricultural and Technical State University, Greensboro, N.C.
- Tuskegee Institute, Tuskegee, Ala.
- Southern University, Baton Rouge, La.
- Prairie View A & M University, Prairie View, Texas
- Howard University, Washington, D.C.

Unshaded areas show states with the largest Black population.